American Gas Association MONTHLY

Outlook for Gas Manufacture

•

Gas Summer Air Conditioning

•

National Conservation Plan

•

Gas Use in Magnesium Plants

•

Utility Manpower Utilization

October 1943

VOLUME XXV NUMBER 10

"...and I'd just lie back and the house would run itself..."

PICTURE YOURSELF in a magic new world . . . where housekeeping as you know it doesn't exist . . .

Where you'll have a marvelous new kind of Gas heating unit that keeps your home not only warm in winter but washed by cool, fresh air in summer — all without a thought from you . . . where amazing new improvements in Gas refrigeration and cooking save hours of work each day . . . where hot water galore makes life easier and happier every time you turn the tap . . .

Only a fancy? Not a bit! Tomorrow you'll be able to have all this — and more, too — *at low cost* in *every type of home.*

For right now in the laboratories of the Gas industry, engineers are working on unbelievable miracles of better living . . . all made possible through the magic of the tiny, blue Gas flame . . . *the flame that cools as well as heats!*

Today Gas is speeding war production. Use it wisely.

But tomorrow it will make your home a more comfortable place than you ever dreamed it could be. Why not hasten the day when you can enjoy these good things — by buying all the War Bonds you can?

AMERICAN GAS ASSOCIATION

THE FLAME THAT WILL BRIGHTEN YOUR FUTURE

GAS

American Gas Association MONTHLY

CONTENTS FOR OCTOBER 1943

There is much to think about in these unprecedented times and this pre-convention, post-summer issue offers a diet rich in thought proteins, both war and post-war variety. . . . The manufactured gas man will take heart and inspiration from Pete Dashiell's appraisal of the fuel oil situation and his citation of the long-time record of technical progress in gas-making. . . . Likewise, the natural gas man will take pride in the splendid war job being done without ballyhoo in such vital spots as the Kaiser magnesium plants. Not content with its well-known role of heating, natural gas is employed in the Kaiser plants in a revolutionary cooling process. . . . George Bean's Washington report is a forthright account of work done for so many by so few. . . . As pace-setter in fuel conservation, the gas industry is well prepared for the new 7-industry national program announced herein. . . . Sewing seeds for post-war harvest, research goes forward on gas air conditioning units for home and factory. The Laboratories' report is noteworthy and significant. . . . For the technical man, articles on desoldering gas meters, rapid determination of CO, and cathodic protection interference, merit careful study.

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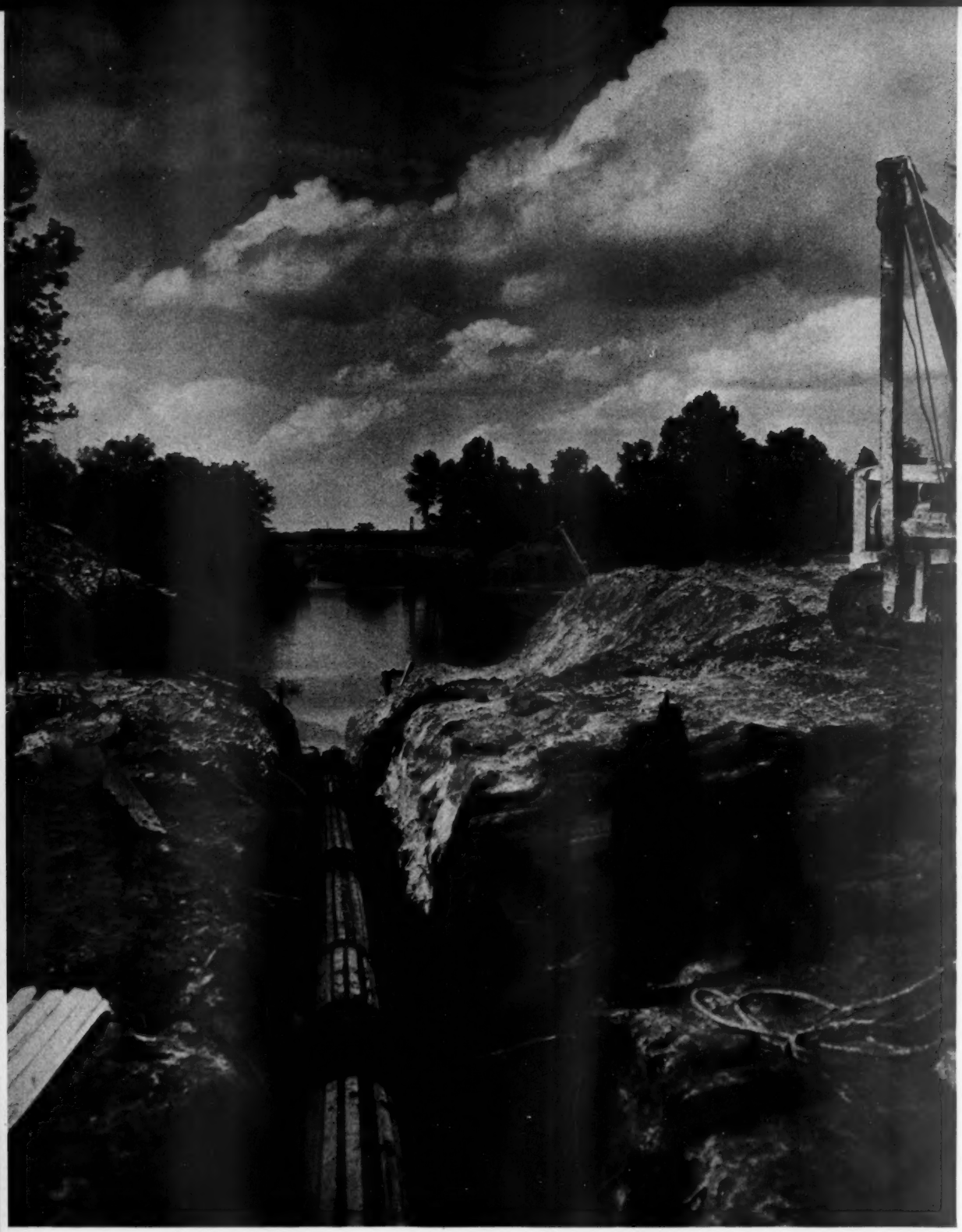

An 18-inch natural gas pipe line to a war plant area being laid across the Ouachita River near Arkadelphia, Ark. Pipe welded on the river bank was pushed across with two side boom "cats." The pipe was first coated, wrapped by machine, and wired with slats to protect it during the laying operation. This MONTHLY prize-winning picture was taken by J. E. Hampson, Arkansas Louisiana Gas Company.

American Gas Association MONTHLY

JAMES M. BEALL, *Editor*

ANNUAL MEETING
. . . War and Post-War Topics on A. G. A. Program

WITH world events moving at a rapid pace, the Twenty-Fifth Annual Meeting of the American Gas Association which takes place October 26, 27 and 28 at the Jefferson Hotel, St. Louis, Missouri, is bound to be a momentous one. It will deal with the No. 1 problem of bringing the war to a quick and victorious conclusion and also will devote considerable attention to the industry's post-war position.

Foremost among the vital war topics to be discussed are those pertaining to effective gas utilization in war industries, production, fuel, materials and manpower conservation and the whole array of problems connected with food production and preparation. Post-war subjects revolve around gas industry research, appliance developments, advertising, marketing, and technological improvements.

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The framework of the program set up consists of a General Luncheon, Wednesday, October 27; General Sessions, Wednesday afternoon, Thursday morning and afternoon, and a General Luncheon, Thursday. The Home Service Breakfast will be held Wednesday. Sectional meetings will take place all day Tuesday and Wednesday morning.

The General Sessions' program will open with a luncheon meeting which will feature an address on the economics of the post-war period by a nationally known economist. Immediately thereafter, the first General Session will be held. Arthur F. Bridge, president of the Association, will make his annual address at this session, reviewing the outstanding events of his administration.

Turning the spotlight directly on the war effort, Ernest R. Acker, vice-president of the Association and chairman of the Committee on War Activities, will speak on "The War and the Gas Industry." Since Mr. Acker has been at the forefront of the industry's cooperative program and has held innumerable conferences with government authorities on war matters, his address is eagerly awaited.

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Another highlight of the first General Session will be an address by a governmental authority on "Food Production, Conservation and Preservation." Growing national concern over the food situation and the gas industry's leadership in this field give this event urgent timeliness.

Other important matters to come before the Wednesday meeting are the election of officers and a report on the Association's finances.

The General Sessions Thursday, both morning and afternoon, will be devoted almost entirely to problems keyed to the future of the gas industry. Recognizing the importance of developing the industry's product and its utilization to the fullest extent, a prominent place has been reserved on the program for a discussion of research and all its ramifications. Marcy L. Sperry, president, Washington Gas Light Co., Washington, D. C., who has been in the vanguard of those calling for a sustained long-term program, will present the latest ideas on this subject.

Colonel Hudson W. Reed, president, The Philadelphia Gas Works Company, will speak on "Forward Thinking on Post-War Industry Needs." Col. Reed is expected to focus attention on post-war plans in the appliance field.

The place of advertising now and after the war, particularly the need for cooperative effort, will be thoroughly analyzed by H. Carl Wolf,

Conflict of dates in St. Louis with the World Series Baseball games causing congestion in hotel and travel facilities made necessary a change in the dates of the A. G. A. Annual Meeting to Tuesday, Wednesday and Thursday, October 26, 27 and 28.

Arthur F. Bridge, President

Ernest R. Acker, Vice-President

Hudson W. Reed

Marcy L. Sperry

Frank H. Adams

A. M. Beebee

president, Atlanta Gas Light Company, and chairman, Committee on National Advertising. Mr. Wolf will certainly stress the need for a strong program that will refute the opinion of a prominent public opinion expert who said, "Your product is better than you are, because you have not sold it to the public."

The manufacturers' point of view in connection with appliance development will be discussed by Frank H. Adams, vice-president, Surface Combustion, and chairman, Post-War Planning Committee, Association of Gas Appliance & Equipment Manufacturers.

A large portion of Thursday's program has been assigned to a comprehensive presentation of the work of the A. G. A. Post-War Planning Committee under the chairmanship of A. M. Beebee, Rochester Gas & Electric Corp. Mr. Beebee will describe the basic planning and achievements of his group in laying the cornerstone of a sound post-war policy. He will then introduce leaders of the separate phases of the committee's investigations who will speak on the following subjects:

"Post-War Purchasing Power and Potential Markets"—C. V. Sorenson, Northern Indiana Public Service Co., Hammond.

"Factors Affecting the Realization of Potential Markets"—R. J. Rutherford, Worcester Gas Light Co., and R. E. Ginna, Rochester Gas & Electric Corp.

"Engineering and Economic Problems within the Gas Industry"—Hall M. Henry, NEGEA Service Corporation, Cambridge.

"National Planning and Trends"—Walter C. Beckjord, vice-president and general manager, Columbia Gas & Electric Corp., New York.

Awards for distinguished service to the gas industry will be presented at the Thursday General Luncheon. These include: Charles A. Munroe Award, Beal Medal, A. G. A. Meritorious Service Award, McCall Home Service Awards and Million-Man-Hour Awards.

The General Sessions will be concluded with reports of the Committees on Resolutions and Time and Place, and closing remarks by President Bridge.

Harry K. Wrench, vice-president and general manager, Minneapolis Gas Light Company, is chairman of the General Sessions' Program Committee. He is assisted by F. M. Banks, vice-president, Southern California Gas Co., Los Angeles; Burt R. Bay, president, Northern Natural Gas Co., Omaha; L. Wade Childress, president, The Laclede Gas Light Co., St. Louis; Lyle C. Harvey, president, The Bryant Heater Co., Cleveland; Col. Hudson W. Reed, The Philadelphia Gas Works Co., Philadelphia, and John West, president, Worcester County Electric Co., Worcester, Mass.

The Local Arrangements Committee consists of Alfred Hirsh, vice-president, The Laclede Gas Light Co., St. Louis, and Ephraim H. Lewis, vice-president, The St. Louis County Gas Co., Webster Groves, Mo.

Following are the tentative programs of the various Sections:

NATURAL GAS SECTION

October 26, 10:00 A.M.

Burt R. Bay

Presiding: Burt R. Bay, Chairman, Natural Gas Section, American Gas Association; President, Northern Natural Gas Company, Omaha, Nebraska.

Opening Remarks—Alexander Forward, Managing Director, American Gas Association.

Chairman's Address—Burt R. Bay.

Address—Ralph K. Davies, Deputy Petroleum Administrator, Petroleum Administration for War, Washington, D. C.

Address—Grover T. Owens, Counsel, Mississippi River Fuel Corporation, Little Rock, Arkansas.

Address (Speaker to be announced)

Presentation of Honorary Awards.

Business Meeting.

ACCOUNTING SECTION

Annual Business Meeting

October 26, 11:00 A.M.

L. A. Mayo

Report of Chairman—L. A. Mayo, Chairman, Accounting Section; Connecticut Light & Power Co., Hartford, Connecticut.

Election of Officers.

October 26, 2:00 P.M.

GENERAL ACCOUNTING ACTIVITIES GROUP MEETING

Stores Expense and the Distribution Thereof under Current Conditions.

Property Records

(a) Utilization of Manpower in the Post-War Period
(b) Significance of Property Records for Purposes Other Than Original Cost
(c) Use of Original Cost Data To Measure Inflation

(d) Determination of Service Lives from Original Cost Studies

General Accounting

(a) Salary Stabilization
(b) Personnel Problems—Post-War and Current
(c) Release of Temporary Employees After the War, Severance Allowances, etc.
(d) Control of Promotional Expenses
(e) Replacement of Office Equipment
(f) Reserve for Deferred Maintenance
(g) Other Post-War Reserves
(h) Impact of Accounting on Management

CUSTOMER ACTIVITIES GROUP MEETING

Training Program for Supervisors

(a) Purpose of Program
(b) Nature of Program
(c) Film "Let's Talk Things Over"
(d) General Summary

Panel and General Discussion of Current and Post-War Problems
(Panel to consist of leader and six members)
Manpower Problems—Today and Tomorrow
Salary and Wage Stabilization
Retention or Abandonment of Present Emergency Practices
Job Training Procedures
Multiplicity of Record Keeping
Uniformity of Certain Utility Practices
Employee Morale During War Time

October 27, 9:30-12:00 Noon

GROUP CONFERENCES

GENERAL ACCOUNTING ACTIVITIES GROUP

Materials and Supplies
Property Records
Taxation Accounting
General Accounting

CUSTOMER ACTIVITIES GROUP

Customer Accounting
Customer Collections
Customer Relations

INDUSTRIAL AND COMMERCIAL GAS SECTION

October 26, 12:00 Noon

THE INDUSTRIAL AND COMMERCIAL GAS LUNCHEON

Ben H. Gardner

Presiding, Ben H. Gardner, Chairman, Industrial and Commercial Gas Section.

The Industrial and Commercial Gas Outlook for the Remainder of the War Period—Paul R. Taylor, Director, Natural Gas Division, Office of War Utilities, War Production Board, Washington, D. C.

October 26, 2:00 P.M.

THE INDUSTRIAL AND COMMERCIAL GAS SESSION

Presiding, Ben H. Gardner, Chairman, Industrial and Commercial Gas Section. Charles G. Young, Vice-Chairman, Industrial and Commercial Gas Section.

The Revolution in Industrial Heating—Frederic O. Hess, President, The Selas Company, Philadelphia, Pa.

Nominations and Election of Officers—H. Carl Wolf, Chairman, Nominating Committee, Atlanta, Ga.

Food Service Equipment Plans for the Post-War Period—By the Food Service Equipment Committee, Roy E. Wright, Chairman, New England Gas and Electric System, Cambridge, Mass.

Presentation of material by:

Metal Treating and Melting Group and Subcommittees—John P. Brosius, Chairman, Equitable Gas Company, Pittsburgh, Pa.

Industrial and Commercial Space Heating Committee—Henry O. Loebell, Chairman, New York, N. Y.

National Advertising Committee—J. P. Leinroth, Chairman, Public Service Electric & Gas Company, Newark, N. J.

The Industrial and Commercial Gas Round Table

Leader, Franklin T. Rainey, The Ohio Fuel Gas Company, Columbus, Ohio.

RESIDENTIAL SECTION

October 27, 10:00 A.M.

B. A. Seiple

The following program has been specially designed so as to include presentations and discussions by nationally known gas company and gas appliance manufacturer executives on such subjects which are thought to be of the greatest current interest and importance to gas company sales managers and executives.

B. A. Seiple, Chairman, Residential Gas Section.

Participants:

"Meeting War-Time Sales Restrictions with an Eye to the Future"—A discussion on the methods used by one of America's largest utility companies in keeping their customers sold on gas today and preparing for tomorrow. F. X. Mettenet, Vice-President, The Peoples Gas Light & Coke Company, Chicago, Illinois.

"Who Will Sell What?"—A preview of the trends in post-war appliance merchandising and sales promotion. Frank C. Smith, President, Houston Natural Gas Corporation, Houston, Texas.

"How Will We Sell Gas Tomorrow?"—A sales-slanted presentation on management, organization and training. Dean H. Mitchell, President, Northern Indiana Public Service Company, Hammond, Indiana.

"Who Accepts Responsibility for Industry Progress?"—A discussion of the dual responsibilities of manufacturers and uilities and how these responsibilities can be met. Louis Ruthenburg, President, Servel, Inc., Evansville, Indiana.

Open Discussion.

HOME SERVICE BREAKFAST

October 27, 8:00 A.M.

Jeannette Campbell

Presiding: Jeannette Campbell, Chairman, A. G. A. Home Service Committee, Minneapolis Gas Light Company, Minneapolis, Minn.

Greetings—A. F. Bridge, President; Alexander Forward, Managing Director; B. A. Seiple, Chairman, Residential Section, American Gas Association.

Home Service in the 1943 programs of the War Food Front:

Food Preservation—A Series of Short Talks: Canning Centers; Oven Dehydration; Loan and Testing of Pressure Cookers; Food Preservation Displays; Fall and Winter Follow-Up Program.
Doris Heidrick, The Gas Service Company, Wichita, Kansas.
Mercedes Bates, Southern California Gas Company, Los Angeles, Cal.
Ruth Sheldon, Washington Gas Light Company, Washington, D. C.

Wartime Campaigns in Food Conservation—Evelyn Blewett, War Advertising Council, New York, N. Y.

Fashions-in-Rations—Billie Burke in person.

TECHNICAL SECTION

October 26, 2:00 P.M.

H. L. Gaidry

Report of Chairman—H. L. Gaidry, Chairman, Technical Section.

Report of Nominating Committee—D. P. Hartson, Chairman, Pittsburgh, Pa.

Report—Gas Production Committee—E. W. Zimmerman, Chairman, Everett, Mass. (To be pre-

sented by F. J. Pfluke.)

High Temperature Gasification: Oil Cracking Tests at Philadelphia—L. J. Willien, Head Consultant, on Manufactured Gas, War Production Board, Washington, D. C. (To be introduced by P. T. Dashiell.)

Discussion.

Mixed Gas Research—H. O. Loebell, New York, N. Y.

Organic Sulphur Research at Institute of Gas Technology—C. H. Riesz and Cornel Wohlberg, Institute of Gas Technology, Chicago, Ill. (To be introduced by H. D. Lehman, Chairman, Committee on Gas Conditioning.)

Open Forum.

October 27, 9:30 A.M.

Chemical Horizons in the Manufactured Gas Industry—E. Holley Poe, Director, Natural Gas and Gasoline Div., PAW, Washington, D. C.

Symposium on Post-War Planning—C. F. Turner, presiding.
Presentation by J. V. Postles, Chairman, Technical Section Committee on Post-War Planning Cooperation.
Presentation by Hall M. Henry.

Symposium on Distribution Studies—H. B. Andersen, presiding.
Tin in Solder—J. H. Collins, Chairman, Subcommittee on Meters and Metering.
Report on Pipe Coatings and Corrosion Research into Microbiological Anaerobic Corrosion—R. F. Hadley, Chairman. (To be presented by A. V. Smith, Philadelphia, Pa.)

Summary of Latest Motor Vehicle Developments—Linn Edsall, Chairman, Committee on Operation of Public Utility Motor Vehicles, Philadelphia, Pa.

Open Forum.

Gas Company Puts Punch into Local Advertising

FOUR important objectives are listed for the Portland (Oregon) Gas & Coke Company's current series of newspaper advertisements featuring the use of gas in various local war production industries.

First, the ads convey by word and picture the vital role that gas is playing in war production by showing it actually on the job.

Second, the ads lay an excellent groundwork for the 1943-44 gas conservation program by emphasizing gas as a critical war production material that should be used wisely.

Third, the ads keep the post-war sales era in mind by emphasizing the superior qualities of gas whether it be used for "biscuits or bushings," which was the catchline of the number one ad in the series. Prestige of gas is further emphasized through the association of these uses of gas with well-known local firms that chose gas for precision war work.

Fourth, the ads help to impress upon present as well as prospective employees the importance of their jobs in an essential industry—in peace time as well as in war time.

Typical advertisements in Portland's "Gas in War Industry" series

Pipe Line to Appalachian Area Authorized

THE Federal Power Commission, at the conclusion of hearing September 20, authorized the issuance of an appropriate certificate of public convenience and necessity to the Tennessee Gas and Transmission Company, Chattanooga, Tennessee, for the construction, operation and maintenance of a new natural gas pipe line from Driscoll, Texas, near Corpus Christi, to the Cornwell compressor station of the Hope Natural Gas Company near Charleston, West Virginia, to augment failing natural gas supplies in the Appalachian area.

The Commission stipulated that the company must begin construction before February 1 and the 1,228-mile line must be completed in time for operation during the winter of 1944-'45.

The Commission also announced indefinite postponement of the hearing on an application by the Hope Natural Gas Company, Clarksburg, West Virginia, for a certificate of convenience and necessity to construct a new natural gas pipe line from the Hugoton gas fields in Kansas and Texas to the company's Cornwell compressor station.

The natural gas pipe line to be constructed by the Tennessee Gas and Transmission Company will extend from Driscoll in a general northeasterly direction through Texas, Louisiana, Mississippi, Tennessee, and Kentucky to its terminus with facilities of the Hope Natural Gas Company in West Virginia. Natural gas for the line is to be supplied by the Chicago Corporation from reserves in the Agua Dulce-Stratton gas field in the Corpus Christi area of Texas, and the line is to have a minimum daily delivery capacity of 207 million cubic feet of gas.

Financial arrangements for the construction of the line will be made by the Chicago Corporation, Chicago, Illinois.

Utility Motor Vehicle ODT Developments

NO more quarterly reports are required to be made to the Office of Defense Transportation of vehicle operation; nor are any more monthly reports of idle vehicles to be made to ODT. ODT can request at any time, a report of a particular month's vehicle operations with regard to the same items that formerly were reported quarterly and these monthly reports are now being obtained from many classes of fleet operators. They may take the form of a national survey or a survey made by a particular regional or local office. There is little prospect of any kind of a report being required from the utilities for some time to come.

Chairman Linn Edsall of the Committee on Operation of Public Utility Motor Vehicles directs attention of motor fleet operators to an article in *Wall Street Journal*, September 4, on the use of synthetic tires.

Outlook for Water Gas Manufacture

P. T. Dashiell

A widely recognized authority describes the water gas process with particular attention to the use of fuel oil for enrichment purposes. In his opinion, "the plans of PAW for the coming Winter are the most constructive yet presented for the relief of the heavy fuel situation." Mr. Dashiell was Chairman of the Water Gas Luncheon at the Association's Production and Chemical Conference last May at which this subject was thoroughly aired.

By P. T. DASHIELL

Vice-President, The Philadelphia Gas Works Co., Philadelphia, Pa.

THE water gas process, brought into successful operation in the early 80's by T. S. C. Lowe, is a chemical process, by which, using the raw materials—steam, carbon in some form, and petroleum in some form—a fuel gas of practically any calorific value between 300 B.t.u. per cu.ft. and 1,000 B.t.u. per cu.ft. can be produced. A casual study of its history will indicate (1) The great diversity of manufacturing materials used; (2) the evidence of the never-ceasing efforts on the part of the gas manufacturers to adapt their apparatus to the use of materials easily obtainable and, therefore, low in cost.

Low Cost Objective

For the blue gas reaction of the generator, three easily obtainable fuels may be used—coke, anthracite coal and bituminous coal, and varying types of each of these. For carburetting, practically any petroleum product which contains a considerable percentage of hydrocarbons of paraffinic or naphthenic nature, may be used for the enrichment of the blue water gas made from carbon and steam. Of these raw materials, the most costly per M cubic foot of gas produced is the carburetting agent, oil. It is remarkable to see how the design of water gas apparatus has been adapted through the years to the changes in the character of available materials of manufacture, always with the objective of using those of lowest cost.

In the early history of water gas manufacture, petroleum naphtha, which is very much like the gasoline of today, was used almost exclusively to carburet blue water gas. As there was little demand for it, it was almost a drug on the market of the oil refiners and was sold at a low price. When there came a demand for it for purposes other than gas making, the price rose markedly, and about the same time gas oil was exceedingly plentiful and at a low price, and water gas equipment was redesigned to substitute that for naphtha which had been generally used in the early plants. Gas oil became in great demand for cracking into gasoline about 1929, and not only did the price rise, but it was practically off the market, at least for large gas manufacturers. Again the manufacturer of water gas reconstructed his equipment and methods of operation for the use of heavy residuum oils.

Modern Water Gas Practice

In modern water gas practice the greatest overall economy can be obtained by operating water gas equipment so as to substitute oil to a considerable extent for solid fuel for the production of a gas of a given calorific value. An important part of the modern process is the production of by-product tar, which in itself is a potential liquid fuel, having a higher calorific value per gallon than the original oil.

In the first plan of the Petroleum Administration for War to substitute light distillates for residual fuel it was shown that the saving in petroleum was more than offset by the increased consumption of coke and the decreased production of tar; and while it would have been physically possible for gas companies to produce gas of sufficient volume and required calorific value by the substitution of such oils, the economics of such process were adverse, and there was insufficient distillate oil to make the substitution, and consequently no directive has been issued that such substitution be made.

Gasoline Substitution

The substitution of off-specification gasoline for residual oils had the same aspect, although much more accentuated than was the case with the light distillate oil. If carburetting material of the nature of gasoline were used in modern water gas apparatus, the result would be disastrous from the point of view of the gas manufacturer, not because he could not produce gas of the required volume and calorific value, but because of the high cost of gasoline, and the almost total absence of tar production and marked increase in the consumption of coke per M cu.ft. of gas produced. A directive for the use of gasoline instead of heavy fuel would obviously have resulted in a large increased cost to the gas companies, gas consumers or taxpayers and the net savings in petroleum consumed would have been relatively small.

In connection with the use of gasoline there developed one interesting feature, which is again adverse to its use by gas companies. In the production of light oil, containing benzol, toluol and xylol fractions to be used for nitration, it is vital that these benzol, toluol and xylol fractions shall be

practically free of hydrocarbons of paraffinic nature. It developed in the test work, which was done to re-explore the possibilities of the use of gasoline, that the light oil produced from the gas carburetted with gasoline was so high in paraffins as to be practically unusable for nitration purposes. This is because of the high paraffinic content of the original gasoline. When carburetting with a petroleum product of lower paraffin content, on the other hand, the fractions from the light oil produced from carburetting water gas are quite satisfactory for nitration. While not the most adverse feature to the use of gasoline, this still has great importance.

PAW Winter Fuel Plans

It is believed that the plans of PAW for the future, specifically for the Winter of 1943-1944, are the most constructive yet presented for the relief of the heavy fuel situation. This plan involves an increase in volume of production of the heavy residual fuel, either by blending with a more expensive gas oil fraction or by operating the refinery equipment so as to leave a higher percentage of gas oil in the residual fuel. This, of course, means an increase in cost of residual fuel because of the admixture with it of a higher priced material. The price of residual fuel oil for combustion in industrial plants is related to the price of solid fuel (coal) and is, therefore, relatively low, whereas the price of gas oil is definitely related to the price of gasoline and is relatively higher. It is obvious that a refiner of oil must be recompensed for the allocation of gas oil to the residual fuel production. If this plan can be carried out to a sufficient degree, gas companies can carry on their operations with assurance of being able to meet their required plant demands without materially increasing the consumption of coke or other solid fuel and without sacrificing their valuable residual—tar—and, if required, can produce benzol, toluol and xylol of good quality. The cost will be advanced somewhat by the use of the more expensive oil, their operations will be upset to a minor degree or not at all,—not nearly to the extent that would have been the case had our industry been forced to use exclusively distillates or gasoline. The proposed plan to widen the gravity range of heavy fuel at a moderate increase in price, briefly described, should produce the desired result and should be accepted by the gas industry with enthusiasm.

It is expected that conditions will be little better during the coming winter with regard to the general supply of oil, but gas companies will be better prepared to handle this condition than during the past Winter. Both the PAW, WPB, and the gas companies understand the situation better than they did last year, and will be in a better position to cooperate in its alleviation.

Association's Directors in Session

Meeting of the Executive Board of the American Gas Association in New York, September 14. Seated, left to right around the table: Col. Hudson W. Reed, C. M. Cohn, James A. Brown, Alexander Forward, President A. F. Bridge, Vice-President E. R. Acker, W. C. Beckjord, Treasurer J. L. Llewellyn, D. W. Harris, Major T. J. Strickler. Standing: Randall J. LeBoeuf, E. J. Boothby, John W. Batten, B. H. Gardner, E. P. Noppel, C. A. Tattersall, C. F. Turner, L. A. Mayo, W. E. Derwent, Kurwin R. Boyes, C. V. Sorenson, G. S. Hawley, E. J. Tucker, H. L. Gaidry, Burt R. Bay, H. N. Mallon

Personnel Conference is Success

WITH about 25 present the second Southwest Personnel Conference of the American Gas Association was held on August 25 and 26, at the Hotel Adolphus in Dallas, Texas. In the absence of the chairman, N. V. Cousins of Shreveport, Willard G. Wiegel, personnel director, Lone Star Gas Company, Dallas, presided. The American Gas Association was again represented by its secretary, Kurwin R. Boyes.

In its short life, the conference has completed two definite accomplishments which should prove of material benefit to gas companies of the area. It has completed a set of distribution job descriptions for WMC approval and prepared "yardstick" rates for those jobs for WLB consideration. The job descriptions were compiled by a committee of which O. L. Jones of Tulsa was chairman and the rates by a committee headed by F. F. McMullen of Houston.

A number of other wartime personnel problems were aired and discussed which made the two-day conference most enlightening to those in attendance. The third Southwest Personnel Conference will be held in Dallas, November 3 and 4.

Navajo Helium Plant Adds to Capacity

THE new helium extraction plant being built by the Bureau of Mines on the Navajo Reservation in New Mexico has been named the Navajo Helium Plant.

Greatly expanded since the United States entered the war, the bureau's helium plants are now producing approximately 25 times as much of this lightweight, noninflammable gas as in prewar days. Currently the bureau is meeting the requirements of the armed forces for antisubmarine blimps, barrage balloons, meteorological balloons and other uses. In addition, considerable quantities of helium are employed for medical purposes, in diving and caisson work, and in welding magnesium airplane parts.

Modification of the original Texas helium plant, completion of a new plant, and construction on three other plants are recent developments in the bureau's helium program. Additional drilling in the Cliffside helium-bearing gas field of Texas also has been done.

Figure 1—Arrangement of Bryant dehumidifier (A), dry air cooler (B), and "resaturator" (C) in cooling capacity test rack. Orifice plenum chamber (D), calibrated water storage vessel (E) for "resaturator" tests also shown

FACTS ABOUT GAS SUMMER AIR CONDITIONING

By F. E. VANDAVEER and W. B. KIRK, *A. G. A. Testing Laboratories*

Material based on research project sponsored by Committee of Executives on Air Conditioning, Davis M. DeBard, Chairman, and the Joint Committee on Air Conditioning, L. Oursoff, Chairman, under the supervision of its Technical Advisory Committee on Gas Summer Air Conditioning Research, G. E. May, Chairman. Complete results are reported in Bulletin No. 18 published in September, 1943.

AFTER years of extensive laboratory research and development and considerable experience with field trials, gas summer air conditioning now holds promise of being a major enterprise for our industry during the post-war period. The faith of a few in the ultimate success of comfort cooling with gas now seems to have been fully justified. It is, therefore, appropriate to mention the outstanding technical achievements of our scientific people, the persistence of a small group of executives and engineers in overcoming practical operating difficulties and in sustaining general interest, and the foresight of interested committees of the American Gas Association which promulgated and guided much of the pioneering research and development. Not content with the remarkable progress made to date, research and development work continues on a large scale. It is reasonable to expect, therefore, that gas summer air conditioning equipment available after the war will provide even better performance than that now installed and in service.

An evaluation of these accomplishments on the basis of a number of field installations and from a comprehensive testing and research program recently completed at the Association's Testing Laboratories under guidance of several of its committees can now be made.

As a result of the above-mentioned activities a wealth of experience and valuable data have been acquired. Plans for full-scale sales promotion after the war are either nearing completion or have been crystallized by executives of gas companies and equipment manufacturers. Servel, Incorporated has already released a 34-page illustrated booklet describing its post-war program for merchandising all-year air conditioners and has presented its proposed program by radio, advertising, and conferences in several cities throughout the country. Gas-fired dehumidifying or dehydrating equipment is being widely used in war industries and has demonstrated its capabilities at this critical time. In addition to accumulating valuable experience, commercial production has reached a paying basis. Certain other large companies such as Carrier Corporation, York Corporation, and Mills Industries Incorporated have been and are continuing to do research on heat-actuated air conditioning equipment. Interest in this new field is increasing.

Present status of gas summer air conditioning of residences and small commercial establishments may be measured by the latest reports on total number of installations made by various manufacturers. For example, Williams Oil-O-Matic Heating Corporation has sold a total of 103 units, with an aggregate refrigerating capacity of 2,305 tons. Servel, Incorporated reports 298 installations with a total refrigerating capacity of 1,384 tons. The Bryant Heater Company has merchandized approximately 775 dehumidifiers in about 600 installations, with an aggregate air delivery capacity of 1,085,000 cfm (average about 1,400 cfm per unit), about half of these being in commercial establishments and residences. The grand total gas consumption of all of the above units would amount to 217,042,000 B.t.u. per hr. at full or normal gas input. Large scale production and aggressive sales promotion, such as being planned by Servel, Inc., constitute the next steps to be taken. Full cooperation of the entire industry is required

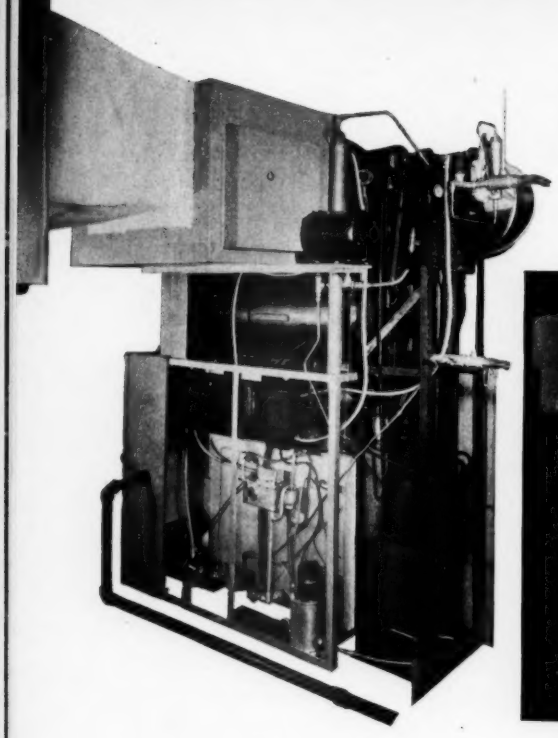


Figure 2—View of side and back of 3-ton Servel all-year air conditioner with jacket removed. Connection to A. G. A. refrigerating capacity test rack shown in upper portion of picture

Figure 3—Servel 5-ton all-year air conditioner

to effectuate these constructive measures.

For industrial and large commercial applications several companies have provided equipment of various kinds adaptable to gas heat or steam which may in turn be generated by gas heat. The Bryant Heater Company has dehumidifiers (or dehydrators) for industrial drying processes with cfm ratings of 500-5000; the Carrier Corporation has compression refrigeration equipment from 100 to 1,100 tons capacity; Pittsburgh Lectrodryer Corporation supplies dehumidifiers for industrial processing in capacities from 350 to 15,000 cfm; Surface Combustion provides dehumidifiers for comfort air conditioning or industrial processing in multiples of 3,000 or 4,000 cfm. Ingersoll Rand Company, Worthington Pump & Machinery Corporation, and York Corporation also have compression refrigeration equipment adaptable to gas.

As an example of the importance of these installations, Pittsburgh Lectrodryer has installed in large industrial establishments about 40 gas-burning dehumidifiers having a total gas consumption of 4,500,000 B.t.u./hr. Surface Combustion has installed 144 units totaling 1,299,000 cfm of air equivalent to 11,200 tons of refrigeration to accomplish the same moisture removal. While these units are regenerated by steam from any source they are all potential gas users. Estimated gas consumption for all Surface Combustion installations would be approximately 190,000,000 B.t.u./hr. Carrier Corporation has installed over 12,000 tons of heat operated refrigeration systems which would have a gas input rating of roughly 199,000,000 B.t.u./hr.

For the past 2½ years the American Gas Association's Committee of Executives on Air Conditioning and its working group, known as the Joint Committee on Air Conditioning, have contributed considerable impetus to the promotion of gas summer air conditioning as a post-war commodity. This has been done through the presentation of papers at technical conferences and meetings by individual members, publications of magazine articles, preparation of reports on field installations, and sponsorship of a testing and research program at the Association's Testing Laboratories under supervision of the Technical Advisory Committee on Gas Summer Air Conditioning Research.

Before experimental work was undertaken, the Technical Advisory Committee on Gas Summer Air Conditioning Research specified that a survey of literature be made, equipment in the field inspected, manufacturers' laboratory facilities appraised and economic and market data assembled. It was decided the main investigation would be confined primarily to comfort applications in the residential and small commercial classification of sizes not exceeding 25 tons. This survey was completed and the results made available

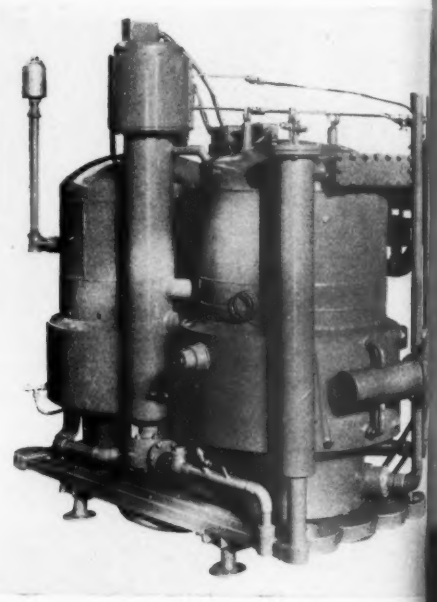


Figure 4—Williams 7-ton package-type absorption refrigeration unit

in July, 1941, in Laboratories Report No. 938-A entitled, "A Survey of Gas Summer Air Conditioning." Findings and recommendations included in this report served as a basis for charting objectives and details of the authorized testing and research program.

Purposes of the subsequent investigation were:

To study performance and construction characteristics of contemporary equipment designed for residential and small commercial applications for the purpose of verifying manufacturers' claims under controlled laboratory conditions.

To assemble handbook data not specifically included in catalogs or reference books.

To recommend, where possible, improvements to equipment manufacturers.

To determine suitability of this equipment in promoting gas summer air conditioning.

To serve as a clearing house for information.

Original objectives of that work have been attained. Results of laboratory tests are correlated and discussed in Laboratories Research Bulletin No. 18, "Gas Summer Air Conditioning," published last month. In addition to presenting handbook results of research and testing on four air conditioners, this bulletin includes other features such as historical background, description of various types of available equipment, discussion of operating costs, and discussion of installation and servicing problems.

A sizable portion of this bulletin is devoted to general air conditioning technology. This material was prepared by John deB. Shepard with the assistance of W. F. Friend* and is specifically intended for the training of sales and service personnel. Definitions of terms, descriptions and explanations of factors affecting air conditions, examples showing the many uses of a psychrometric chart, sample computations and design data sheets are presented in clear and concise form. This material will undoubtedly be used by many gas companies in their training programs. For this reason reprints of this part of the bulletin have also been made available.

At the time this research project was started, three manufacturers supplying gas-fired comfort cooling equipment in sizes suitable for domestic or small commercial installations had already brought their systems through initial field trials successfully. These were Bryant Heater Company, Servel Incorporated, and Williams Oil-O-Matic Heating Corporation. A combination of good basic design, efficient and prompt service by manufacturers' field engineers, and well-planned educational programs for gas company men within reasonable limits of the capacities of each organization involved has created an enviable reputation for all three makes. Likewise, the respective manufacturers are all looking forward to the time when they can resume peace-time production.

Bryant and Servel units are operated directly with gas fuel. Williams systems are operated with steam at approximately 12 lbs. per sq.in. (gage) so that a separate source of steam supply must be available. Because of the low steam pressure required, however, domestic gas-fired boilers are most suitable for this purpose. Models submitted by these organizations to the Testing Laboratories for this investigation were a Bryant No. 14R assembly, 3-ton and 5-ton Servel all-year air conditioners and a Williams 7-ton unit. The Servel 3-ton unit was charged with lithium chloride brine as solvent and the 5-ton unit with lithium bromide. This latter brine has more desirable characteristics as a solvent than the chloride because it does not tend to crystallize out of solution as readily under improper operating conditions and is essentially as effective a solvent as the chloride brine.

Bryant silica gel dehumidifiers, or dehydrators, with or without dry air coolers, are employed primarily in industrial applications where dried air or gases are required, but may be converted to comfort cooling systems by addition of a dry air cooler and "resaturator" which are available from the manufacturer. In passing through the dehumidifier, air temperature and heat content are increased appreciably due to heat generated by the drying process, resistance to air flow through the drying bed and some heat losses from the silica gel reactivation chamber. For example, air entering the system at 80° F. dry bulb, 67° F. wet bulb leaves the dehumidifier at 128° F. dry bulb and 73° F. wet bulb although its moisture content has been decreased from 78 to 35 grains per lb. When passed through the dry air cooler (cooling water coil) air temperatures are reduced to 86 and 60° F. dry and wet bulb respectively with no change in moisture content. Partial rehumidification

* Mr. Shepard is air conditioning engineer, Consolidated Gas Electric Light and Power Company of Baltimore. Mr. Friend is mechanical engineer, Ebasco Services, Inc. Both are members of the Technical Advisory Committee on Gas Summer Air Conditioning Research.

Figure 5—Bryant rotary silica gel dehumidifier

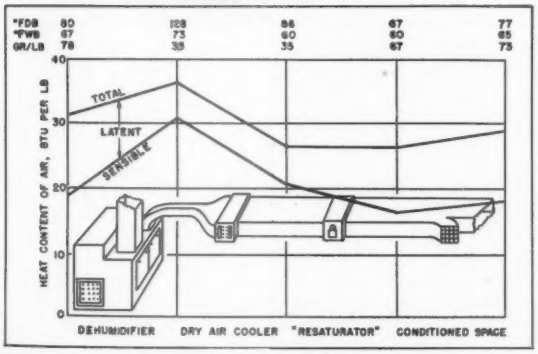


Figure 6—Bryant system of comfort cooling

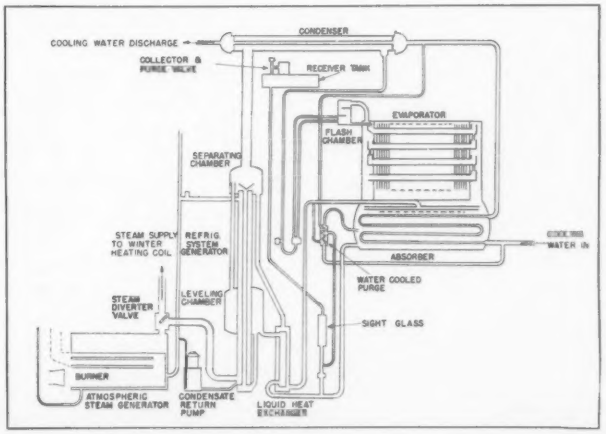


Figure 7—Diagram of essential parts of Servel all-year air conditioner

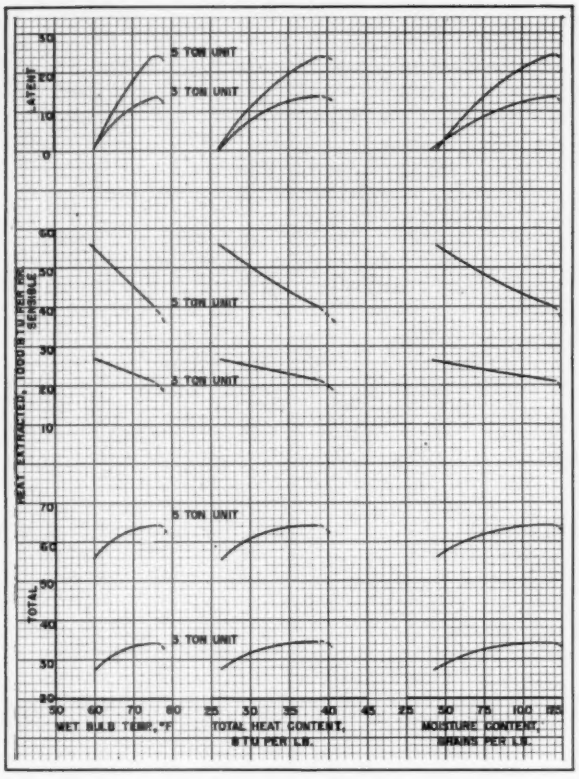


Figure 8—Effect of inlet air wet bulb temperature, total heat content, or moisture content on performance of Servel 3- and 5-ton all-year air conditioners

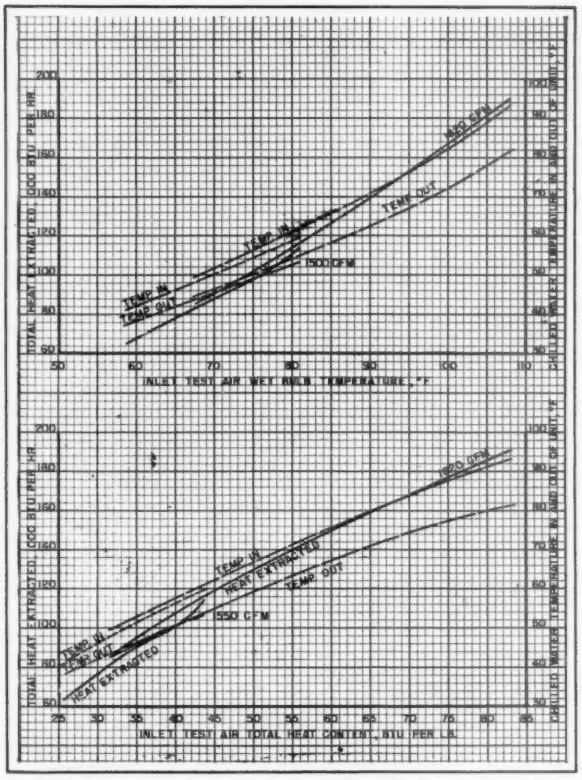


Figure 9—Effect of increasing wet bulb temperature and total heat content of inlet air on performance of Williams unit

in the "resaturator" then serves to decrease air temperatures to 67 and 60° F. dry and wet bulb respectively while moisture content increases to 67 grains per lb. before it is discharged from the system.

In rotary type dehumidifiers, a layer of silica gel approximately 1 in. thick is contained in a rotating wire drum divided into two compartments by a stationary vertical wall so that while one side of the drum is drying air, the gel in the other side is being reactivated. Reactivation is accomplished simply by drawing hot combustion products from a gas burner and heated air through the silica gel and discharging resultant exhaust gases through a stack. Reactivated gel is also cooled by air just before passing from the reactivation chamber to the air-drying chamber.

Servel Incorporated, and Williams Oil-O-Matic Heating Corporation have developed new and ingenious absorption refrigeration systems in which a refrigerant is expelled in vapor form from a refrigerant-solvent solution by applying heat. This refrigerant vapor is condensed to a liquid with cooling water and then revaporized at a lower pressure to produce a chilling effect either on air directly surrounding the coil (Servel) or on circulated chilled water (Williams) or brine. Vaporized refrigerant is then absorbed or dissolved in solvent and returned to the generator to complete the cycle. Through effective use of thermal syphon action Servel engineers have eliminated motorized circulating pumps except for a small unit for condensation return to the steam boiler.

Refrigerant-solvent combinations employed in the Servel and Williams units are water-lithium bromide brine, and methylene chloride dimethyl ether of tetraethylene glycol respectively. High-low side operating pressures are 1 to 0.15 lb. per sq.in. absolute (normal atmospheric pressure is 14.7 lb. per sq.in.) in the Servel, and 17 to 4 lb. per sq.in. absolute in the Williams.

Servel all-year air conditioners include both winter and summer air conditioning features in one compact and complete unit of a size comparable to modern central heating gas equipment. No accessory items, such as blowers, coils, etc., are necessary to complete an installation. The winter air conditioner section of contemporary models have been tested and approved under American Standard Approval Requirements for Central Heating Gas Appliances and they are therefore entitled to display the Laboratories' Approval Seal of the American Gas Association.

Mills Industries, Incorporated is also developing an absorption type air conditioner, and is still perfecting its system. A few units have been installed in various localities to determine major operating difficulties, but it has not been placed on the market. A sample unit was submitted to the Testing Laboratories, but results of tests extending over a period of four months are not included in Bulletin No. 18 because

they are not representative of a production model. However, data obtained will undoubtedly be useful to the Mills engineers in further development work.

In addition to determining refrigerating capacity ratings of the Bryant, Servel and Williams units under American Society of Refrigerating Engineers standard conditions, the effects of varying intake air moisture and heat contents, rate of air flow, heat input, cooling water temperature and flow rate, and chilled water flow rate, on cooling capacities were observed. In general, these gas air conditioners responded remarkably well to extreme conditions during more than 80 tests imposed on them. In all instances manufacturers' ratings were found to be substantially correct. Results obtained have been coordinated and plotted so that performance trends to be expected under practically any field condition may be predicted with reasonable accuracy by reference to these charts.

Typical data for each of the three conditioners tested are shown in Figures 8, 9 and 10. Effects of increasing inlet air wet bulb temperature (or total heat content†) and moisture content on the performance of a Servel 3-ton and a 5-ton unit are graphically illustrated in Figure 8. Other illustrations of effects of increasing total heat content of inlet air on performance of a Williams 7-ton unit and Bryant No. 14R assembly are shown in Figures 9 and 10 respectively. In every instance total and latent heat extracted generally increased with heat and/or moisture load. This is the type of performance that is to be expected of a well-designed and effective air-cooling system.

Supplementary construction and performance tests following procedures included in American Standard Approval Requirements for Central Heating Gas Appliances indicated that all three of these systems are substantially and durably constructed, and were capable of safe and efficient performance.

Operating costs with systems operated at rated capacities have been computed for various gas and water rates. From these data comparisons are made with operating costs of electric compressor systems in such a way that it is possible to determine where gas equipment is competitive with electric equipment at various gas and electric rates. For example, a Servel unit with cooling tower may be operated at a cost of 4.65 cents per ton-hr. of refrigerating effect with a high gas rate of 18 cents per therm, while an electric compressor system would do the same work for 4.75 cents per ton-hr. with an electricity rate of 4 cents per KWH. At 8 cents per therm for gas, Servel units may be operated at a lower cost (0.25 cents per ton-hr. less) than electric units with an electricity rate of only 2 cents per KWH.

Principle conclusions based on above facts and A. G. A. Laboratories tests may accordingly be made:

1. Representative sizes of Bryant, Servel, and Williams gas summer air conditioners showed generally satisfactory performance over greater extremes of inlet air temperature and humidity than would normally be encountered in service. Cooling capacity ratings established by the respective manufacturers were verified. In effect these manufacturers have developed equipment to the point where its operation is satisfactory.
2. Systems mentioned in (1) above were found to comply with applicable national requirements for safety, durability and substantiality.
3. Both operating and initial costs of gas summer air conditioners tested are within competitive range of equipment using other sources of energy. All-year air conditioning, lower maintenance, possibility of more flexible control and dependability, are advantages in favor of gas-fired units.
4. Several unsatisfactory operating characteristics disclosed by these tests were reported to the respective manufacturers and were confirmed by field experience of several gas companies. This resulted either in immediate improvement of

(Continued on page 416)

† Wet bulb temperature of air determines its total heat content.

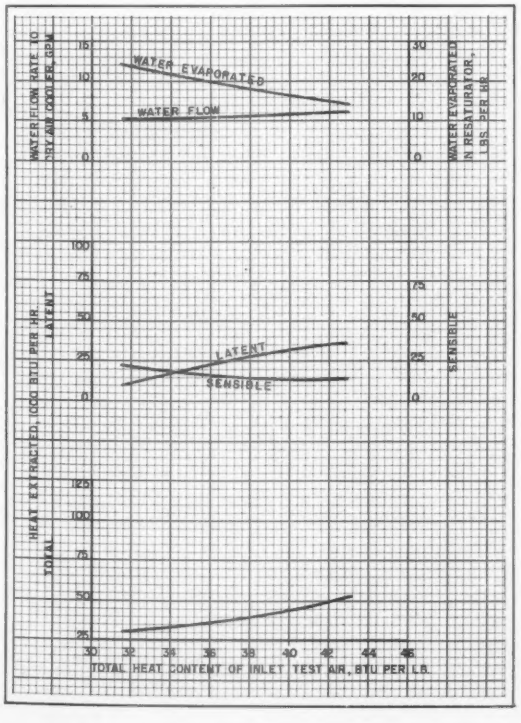


Figure 10—Effect of total heat content of inlet test air on performance of Bryant No. 14R assembly

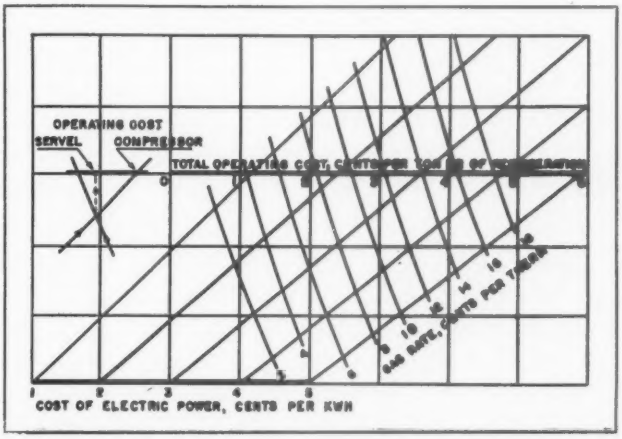


Figure 11—Comparative operating costs of Servel unit and electric compressor unit with cooling tower for various gas and electric rates

Signs of the Times

War scarcities have revived the old "Trading Post" idea on more than one utility sales floor. This unique and effective post set up by the San Antonio utility, the City Public Service Board, has aided many to buy or sell gas and electric appliances. Note the loose-leaf folder in front where more details are listed

William J. Judge Retires Oct. 1

WILLIAM J. JUDGE, president of National Fuel Gas Company since 1919, retired from active service October first. He began his employment with the subsidiaries of Natural Gas Trust (predecessor of National Fuel Gas Company) and with the pipe-line subsidiaries of Standard Oil Trust (later Standard Oil Co., New Jersey) a few weeks after graduating from Oil City High School in 1890. In 1899 he became a member of the general auditor's staff; was appointed assistant general auditor in 1903 and general auditor in 1913, in which year he transferred his office from Oil City to New York City.

In July, 1915 he was elected vice-president and director of National Fuel Gas Company and in 1919 elected president. The field of operations of the many natural gas, pipe-line, and oil-producing companies with which he served extended from New York to Oklahoma and he was conversant with all branches of the business of such companies.

He devoted most of his time to the financial and accounting branches in which he introduced methods and systems that were widely adopted in the oil and gas industry.

He is credited with conceiving the idea of underground storage of natural gas and putting it into practice. In the summer of 1915 he accomplished it successfully in the Welland County, Ontario, Canada, gas fields and a year later extended the practice, in much greater volume, to the Erie County, New York, gas fields about twenty miles south of the City of Buffalo. Since that time the practice has been extended to other natural gas producing areas.

In 1921 he contracted for the purchase of coke-oven gas at Buffalo and began the mixing of natural gas and coke-oven gas for the purpose of conserving the supply of natural gas. Today seventy per cent of the consumers of National Fuel Gas Company are supplied with mixed gas.

Mr. Judge will be succeeded as president of National Fuel Gas Company by Leigh A. Brown who has been vice-president of that company and who has also been president, since 1934, of Iroquois Gas Corporation and the other subsidiaries located at Buffalo. He began service with those companies as an engineer in 1912, after graduating from Cornell University. Mr. Brown will be succeeded as vice-president of National Fuel Gas Company by William H. Locke, who is also president of Pennsylvania Gas Company at Warren, Pennsylvania, and who is a graduate engineer of Pennsylvania State College and has been an official of subsidiaries of National Fuel Gas Company for the past 18 years.

Gas Men Instruct in War Program

FOUR Southern California Gas Co. men are making an important contribution to the war effort by participating as instructors in an "Engineering Science and Management War Training Program" currently being carried on at the University of Southern California.

R. B. Grossman, industrial sales supervisor, is teaching a course in utilization of natural gas and substitute fuels, designed to give training in the better use of fuels. The technology of butadiene, to provide training for work in the new synthetic rubber industry, is being taught by Herbert F. Weide of the research department. J. S. Powell and William A. McGlashen, both engineers in the research department, are giving courses in gas analysis and gas calorimetry to prepare trainees for work in the gas industry.

Gas Industry Going to Town, Serviceman Says

THE gas industry is on its toes and ready to go places with its new national advertising and post-war program. At least that is the considered opinion of one member of the industry now serving under Uncle Sam. Private Fred Keune, gas sales manager, Florida Power & Light Co., Miami, writes from Fort Knox:

"I was so pepped up over the articles in the September A. G. A. MONTHLY relating to the new industry advertising program and Servel's post-war action program that I wrote Carl Wolf and George Jones expressing my reaction as a serviceman towards the industry's present activities.

"The initial advertising surely hits the spot. Strictly modern and the old blue flame has at last been brought out of hiding and is now proudly presented as our guidon.

"Servel is to be congratulated on its *action*. So much is being dished out about this and that and 'just you wait and see,' that you soon by-pass it as just another one of those things. Servel presents a definite program straight from the shoulder and puts it squarely up to the operators to do something.

"I know that all members of the gas industry who read the September issue will feel that the prospects for opportunities in the gas field await servicemen due to the leadership of men who head up the key spots of the gas business."

Report from Washington . . . *A Summary of A. G. A. Work with Government Agencies*

George W. Bean

- **Mr. Bean's article gives a glimpse of the amount and nature of the business handled by his office during the past year. It is an impressive and illuminating record of accomplishment achieved in the best Washington tradition.**
- **The Washington Office acts as a clearing house for the dissemination of information, and the clarification of Government rules and regulations affecting the gas industry. It has been helpful to many companies and stands ready to be of service whenever called upon by A. G. A. members.**

By GEORGE W. BEAN

Fuel Consultant, American Gas Association, Washington, D. C.

THE Washington Office of the American Gas Association has had a most interesting and active year handling important matters for the gas industry. The number of cases handled for the year ending August 31, 1943, amounted to a total of 1,967, or nearly 400 more than handled in the previous year. The cases this year have been of greater importance to the industry due to their emergency character which has necessitated frequent conferences in order to expedite decisions. The large percentage of the work has been with the War Production Board. These cases were divided substantially as follows:

521	Letter Applications under U-1
582	PD-1A Applications
67	Projects (Defense Plants)
506	Exceptions to Orders L-31 and L-174
65	Government Projects
35	Defense Housing Projects
137	Applications under Order L-79
54	Applications under Order P-98-b
1,967	Total

Many changes have been made during the year in the various orders and their related forms and a brief explanation is advisable before reporting on the work of the Washington Office. Orders have been revised, amended or revoked. The Office of War Utilities has replaced the Power Branch and "Cap" J. A. Krug was made Director. Under "Cap" Krug the OWU has been almost completely reorganized with an excellent and experienced personnel.

Paul R. Taylor is Director of the Natural Gas Division, and is ably assisted by C. L. Brockschmidt, J. A. Farber and other experienced natural gas men. The Natural Gas Division administers Order L-31 which restricts the use of natural gas in specified areas, and controls operations to overcome shortages. Form WPB-1707 replaces the old PD-673 and is used when making application for increased delivery of natural or mixed gas for space heating. An increased delivery of natural gas or mixed gas for uses other than space heating should be made on the new WPB-1709 Form which replaces PD-672.

The Manufactured Gas Division is headed by Alexander Macomber as Director, and he has many competent assistants including Fred Kimball, Walter Groth and George L. Schanz. Order L-174 requires utilities to produce maximum output, provides for pooling of resources when required, requires reduction of supply of gas to consumers when necessary, and places restrictions on increased deliveries to consumers and also on deliveries for space heating. The old Forms PD-672 and PD-673 were used also for applications for exemption under Order L-174, but now the order has a form all its own. WPB-3138 very recently released is used for both space heating and non-space heating applications and is of letter size and one copy only is required. Both the Natural and Manufactured Gas Divisions are very cooperative and are always current in their work. Many times when an emergency arises in an Army or Navy post, telegraphic authority will be given.

Utilities Order U-1 superseded Order P-46. This order provides AA-1 rating to deliveries for maintenance, repair and operating supplies of electric, gas, water and steam utilities. It also establishes procedure for obtaining controlled materials and restricts delivery, inventory, withdrawals, additions to plant, or sales from inventory. U-1 has six supplements as follows:

U-1-a permits service connections to facilities of Army, Navy, and Maritime Commission if not over 250 feet in length, and the cost does not exceed $1,500 for underground construction.

U-1-b permits gas and electric service connections to be made for operation of a gas or electric range in the dwelling of a domestic consumer if not located in a restricted area.

U-1-c permits electric service connections to permit operation of farm production equipment, subject to certain provisions.

U-1-d permits electric, gas and water connections to be made to premises being constructed or remodeled under Order L-41, if certain conditions are met.

U-1-e permits water service connections to be made to victory gardens.

U-1-f is the most recent supplement to Order U-1 and permits an extension of electric, gas or central steam heat services to a consumer located in a critical housing area. In the case of a gas extension, up to 170 pounds of steel pipe or 1200 pounds of cast iron pipe may be used. However, cast iron pipe must be used if the pressure is less than 100 pounds. Steel pipe must be available in excess inventory.

This order is administered by Paul B. Valle, George H. Smith is Chief of the Gas Materials Distribution Branch for both natural and manufactured gas. Application Form WPB-2774 replaces the old PD-1A, PD-200 and PD-200B

Forms under U-1 and is used for all applications to begin construction, for priority assistance and for an allotment of controlled materials for utility construction.

One interesting feature in connection with the operation of Order U-1 is the inventory control administered by Harry Miller and assisted by Harry Wolfe. Applications were handled for large distributing companies that have many warehouses over their systems. In such cases permission was granted to increase the general inventories in order that a sufficient supply would be on hand in the various warehouses.

The Controlled Materials Plan has greatly simplified the processing of applications. Last year frequent appeals had to be made for higher ratings on approved applications, but under CMP the controlled materials are allocated and the applicant has no difficulty in obtaining them. CMP Regulation 5 permits a utility to obtain materials from supplier for maintenance, repair and operating without a preference rating by simply extending CMP allotment symbol.

There are many orders administered by the Plumbing and Heating Division of the War Production Board. Order L-23-c restricts the manufacture of domestic cooking appliances and domestic heating stoves as to quantity and critical materials used. The exchange of metal plumbing and heating equipment is restricted by Order L-79. The production of water heaters and the use of copper in their manufacture is controlled by Order L-185. Plumbing and Heating Emergency Repairs are covered by Order P-84. This order permits the replacement of wornout equipment and also includes a list of rationed equipment. Appeals from these orders are filed on Forms WPB-1477 and WPB-1529.

Cooperation with Army and Navy

The Washington Office has cooperated very closely with the Army, Navy, Air Forces and the gas utilities in fuel problems at their projects which include Army Barracks, Hospitals, Air Bases, Naval Air Stations and Flying Schools. At one Army Base in the south west the monthly consumption of natural gas for space heating and non-space heating equipment approximated nearly 23,600,000 cubic feet. A Naval Air Training Station, also in the southwest, is using approximately 7,500,000 cubic feet of natural gas per month for space heating and non-space heating.

Many defense housing projects were handled for gas companies by giving them assistance in obtaining critical materials for their fuel needs. One of the largest of these is located in New England where more than 2,500,000 cubic feet of manufactured gas is consumed per month.

The production, transportation, refining and marketing of petroleum is covered by Order P-98-b and is administered by the Office of Petroleum Administration for War. This order has been amended several times during the year. The Natural Gas and Natural Gasoline Division is headed by our good friend Holley Poe and his office personnel has been most cooperative in handling appeals to the order.

Brooklyn Union fires an advertising broadside in the War Bond campaign

The Liquefied Petroleum Gas Section was transferred from the War Production Board during the year to the Petroleum Administration for War. Order L-86 regulates the installation of liquefied petroleum gas equipment. The old PD-397 Form used for making appeals has been superseded by WPB-809.

Interesting cases in connection with liquefied petroleum gas were applications for Presidential approval through the office of the Bureau of Economic Warfare, since replaced by the Office of Economic Warfare, of licenses for exporting LP-Gas across the border into Mexico.

A great amount of work was done early in the year in connection with Order M-43-b which limits the use of tin in gas meters. The order was in keeping with the wishes of the gas industry and much credit is due Ernest R. Acker, Chairman of the Committee on War Activities, for its final adoption.

Great effort has been made to have all Government specifications for gas-fired equipment include the provision that they be approved by the American Gas Association Testing Laboratories. At present practically all Government specifications carry that requirement. However, there have been some exceptions in which cases most excellent work has been done by both R. M. Conner and F. R. Wright where they have attended Government conferences arranged for them.

Hospital Building Program

There will naturally be a tremendous hospital building program which will necessitate a great amount of work, but which will not begin until the early part of 1944. In fact the work of the office will no doubt be materially increased during 1944, largely due to the necessity of pipeline companies and distributing companies needing materials for extensions and equipment to replace that worn out.

The contacts of the Washington Office with the various Government Departments are of the very highest and the results accomplished have been most satisfactory. Because of the many conferences and the amount of work to be done with the many divisions of the War Production Board, Special Visitor's Passes have been issued to the staff of the Washington Office which permits the expediting of the work very materially. The office is a clearing house for the dissemination of information, and the clarification of rules and regulations as between members of the Association and the Government. The prompt solution of many of the problems has been largely due to arranging of conferences between Government officials and executives of the industry.

Conservation Program . . . *Industry-Government Campaign to Save Fuels, Materials*

A SEVEN-POINT conservation campaign sponsored jointly by government and industry to save fuels, critical materials and manpower was launched last month by the heads of three major war agencies. In a special message sent out by Donald Nelson, WPB chairman; Harold L. Ickes, Solid Fuels Administrator and Petroleum Administrator for War, and Joseph B. Eastman, director of ODT, voluntary conservation of gas, coal, oil, electricity, communication equipment, water and transportation, was put up to the American people as a war necessity.

The program which was launched September 15 had been prepared at the request of WPB by task forces representing the industries involved. It calls for restraint in home, industrial and commercial use of these seven facilities which "comprise the life blood and nerves of our industrial effort."

Local Machinery Set Up

Much of the campaign will be handled on both a national and local level by the industries involved. These industries have set up machinery and advertising campaigns showing individuals what can be done to conserve resources. Announcements, fact sheets, and other material have been prepared, and the program will be pushed throughout the winter in every channel disseminating information.

In a letter to the American Gas Association and other organizations backing the drive, the heads of government agencies directing the program explained that "although the savings in a single household, commercial establishment or industrial plant may seem insignificant, the possible aggregate savings are tremendous." They estimate that a 10% cut in domestic and commercial use of coal for heating would save 20,000,000 tons annually, a 10% saving in domestic and commercial electricity would save 4,000,000 tons of coal and 75,000,000 light bulbs; a 10% saving in manufactured gas would save 1,500,000 barrels of fuel oil.

The gas industry's part in the program has been outlined in reports of the task committees of the manufactured and natural gas industries which have been distributed by the WPB to all gas companies. The Task Committee of the Manufactured Gas Industry is under the Chairmanship of Alexander Macomber, Director, Manufactured Gas Division, Office of War Utilities, WPB, with Ernest R. Acker, President, Central Hudson Gas & Electric Corp., Poughkeepsie, New York, as Vice-Chairman. Paul R. Taylor, Director, Natural Gas Division, OWU, is government presiding officer, and B. C. Adams, President, The Gas Service Co., Kansas City, Mo., is Chairman of the Task Committee of the Natural Gas Industry.

Inter-Industry Committee

The industries involved are represented in the planning and administration of the new program by an Inter-Industry Committee made up of two representatives of each industry task committee. In the case of the manufactured gas industry, these are Mr. Acker, who is also Chairman of the A.G.A. Committee on War Activities, and E. H. Eacker, Vice-President, Boston Consolidated Gas Co., while the Task Committee of the Natural Gas Industry is represented by J. W. Batten, Vice-President and General Manager, Michigan Consolidated Gas Co., Detroit, and J. French Robinson, President, The East Ohio Gas Co., Cleveland.

The first meeting of the Inter-Industry Conservation Committee was held in Washington on August 24 with leading officials of the resonsible government agencies. Donald M. Nelson, Chairman of the War Production Board, presided and outlined the necessity for and the objectives of the conservation program. He called particular attention to the critical situation with regard to coal supplies including the recent loss of output and the increase in export requirements and appealed to the industry representatives for full and active support of voluntary conservation measures to meet the requirements of the war effort.

The following governmental officials outlined the situation in their respective fields and urged the grave necessity for full cooperation of the industries and governmental agencies in the conservation program to provide the vital materials, supplies and services required for the war production program: Harold A. Gray, Executive Administrator, Solid Fuels Administration for War; Joseph B. Eastman, Director, ODT; Robert E. Allen, Assistant Deputy Administrator, PAW; J. A. Krug, Director of War Utilities, WPB; Arthur D. Whiteside, Vice-Chairman for Civilian Requirements, WPB.

Natural Gas Participation

The natural gas task group's report, pertaining to natural and mixed gas, states: "The natural gas industry's participation in this program will primarily result in the savings of coal, petroleum products and transportation during the periods of peak demands when alternate fuels are used as standby by industrial consumers. The reduction in consumption through voluntary conservation will also minimize the requirements of natural gas companies for critical materials used in drilling and the expansion of gathering lines and transportation facilities. In addition, on certain natural gas systems conservation will result in the introduction of gas into storage fields during off-peak periods to augment

supplies during peak periods, and thereby reduce the requirements for materials to meet seasonal peak demands."

As pointed out in the manufactured gas report, distributed by WPB, "the manufactured gas utilities are in an excellent position to contribute to the success of this broad conservation program of WPB, PAW and ODT in cooperation with the industries concerned because of the successful gas conservation campaigns promoted by the American Gas Association in the Fall and Winter of last year to save fuel, oil and other critical materials." Results of that program, an analysis of 78 companies showed, indicated a saving of 12,000,000 gallons of enrichment oil during November, December and January, and additional savings in February and March which were unreported. Also, the aggregate maximum day send-outs of the 78 companies reporting was some 40,000,000 cubic feet less than their total anticipated maximum day send-outs.

At the request of J. A. Krug, Director, OWU, the Association has recently provided manufactured gas utilities with additional advertising campaign material for the purpose of facilitating their participation in the national conservation program.

Local Cooperation Urged

The task committee report recommends that the manufactured gas utilities consult with and keep closely in touch with the local units of other major industries involved in the program so that their efforts to stimulate conservation may be fully synchronized with those of all other organizations. It further recommends that gas utilities participate in and contribute to the fullest extent possible toward the activities and programs of any local fuel councils which may be organized in support of the conservation program.

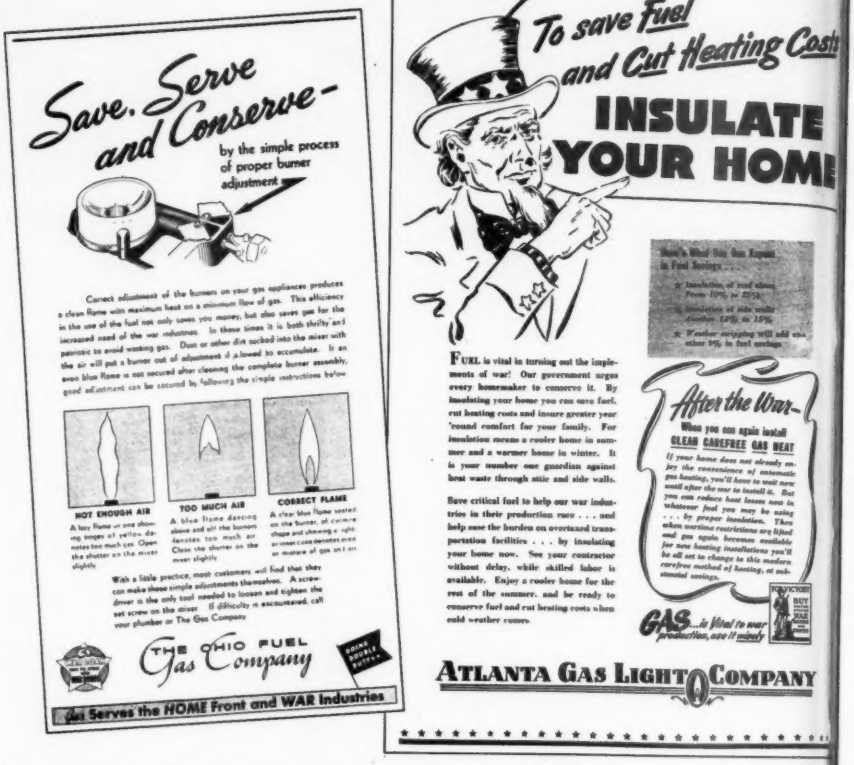
Specifically, the task committees of the gas industry recommend the following gas conservation measures:

Home Conservation Measures

Home owners can save gas in the following ways:

Cooking—

Don't use the gas range oven for kitchen heating.



Gas conservation advertising supporting the government's national program to save vital fuels and equipment

Economize in use of gas range, as follows:

- Use a low blue flame.
- Cut down on amount of water in which to cook vegetables.
- Cook more one-dish meals, and cook whole meals in oven whenever possible.
- Keep burners clean.
- Place utensil over top burner before lighting the gas.
- Turn the gas off before removing utensil from burner.
- Oven peeking is wasteful of fuel and time.
- Don't overcook foods.
- Water boils at 212°F. Violent boiling cannot make it any hotter and will not speed up cooking. Lower gas flame when liquids start boiling.

Refrigeration—

- Economize in the use of the refrigerator by not leaving the door open, not putting hot or warm dishes in refrigerator, and not crowding.
- Never forget to reset refrigerator temperature control to normal after quick freezing.

Water Heating—

- Economize in use of water heater by repairing leaky faucets, insulating pipes and tanks, not leaving hot water running while washing, not filling tubs for baths, and setting automatic water heater thermostat at a minimum (120°-140°).

House Heating—

- Reduce house air-leakage by insulation, storm sash, weather stripping, caulking.
- Set heating thermostat at not over 65 degrees and lower throughout as many hours as possible. Shut off parts of the house not in use.
- Shut off and disconnect heat supply to garage. Keep garage door closed at all times.
- Turn off heat before opening windows. Close doors in rooms with open windows. Turn thermostat down if it is in room where windows are open.
- Close fireplace damper when fireplace is not in use. Make certain the damper fits tight. Open or loose fitting fireplace dampers are one of the greatest heat wasters, as any opening to the chimney will draw the heat out of the room.
- Put heating system in top-notch condition, as follows: Inspect air valves on all radiators. Replace, clean, or repair any found inoperative. Inspect air valves regularly during the heating season. In hot water systems open valves once a month to let out accumulated air. Do not cover or improperly enclose radiators in actual use. Keep doors closed.
- In cases where there is no thermostatic control, use heaters only at such times as actually needed in the rooms heated.

One of the first gas company announcements of the inauguration of a seven-industry coordinated conservation campaign

Commercial Gas-Saving Hints

Commercial establishments can save gas in the following ways:

Have gas burners clean and properly adjusted.
Have equipment clean and free of carbon and deposits.
Have thermostats checked for accuracy and operate equipment at correct temperatures.
Cut down heat to a minimum at off-peak hours.
Don't use two ovens when one will do.
Don't overcook foods.
Load ovens to capacity when roasting or baking.
Roast the "low temperature way."
Open range or baking oven doors as seldom as possible.
When finished using oven turn fuel control to "off" position.
Clean oven interior daily and after roasting.
Water boils at 212°F. Violent boiling cannot make it any hotter and will not speed up cooking. Lower gas flame when liquids start boiling.
Schedule roasting and baking to take full advantage of "receding heat."
With large ovens plan your baking so as not to have to bring oven up to a full heat more than once or twice a day.
You don't hasten recovery by turning temperature setting beyond the degree needed for frying.
Turn flame low when broiler is idling.
Don't overheat the griddle.
Turn down burners during slack period.
A low or medium flame is best for light frying. Only heavy frying requires burner on full.

Industrial Gas Conservation

Industries can save gas in the following ways:

The highly competitive situation in the field of industrial gas utilization effectively controls the efficient operation of industrial gas equipment and thus limits the possibility of further conservation. In most cases, the gas utilities have cooperated with their industrial customers to insure efficient installations and have continued to utilize the services of their industrial gas engineers in the interest of efficient operation.

Notwithstanding these facts, the following gas-saving recommendations are suggested for industrial customers:

Keep gas burners clean and properly adjusted.
Keep equipment free of carbon and other deposits.
Have thermostat controls checked for accuracy.
Turn off gas supply when equipment is not in use.
Schedule work and materials for capacity operation of equipment at all times.
Have equipment checked frequently to make sure all burners and controls are in good working order.
Insulate equipment when possible to reduce heat loss.
Discourage the use of gas in make-shift heating appliances by workers in industrial plants through appeals to managers of such plants.

The gas industry takes pride in the fact that the voluntary nation-wide conservation program now under way represents a broadening of conservation activities which have been conducted by the American Gas Association during the past year. As pointed out by Mr. Acker in his report to the industry on Sept. 3, "The gas industry as a whole, by virtue of its previous experience in promoting gas conservation measures, is in a position to give wholehearted and effective support to the new conservation program which is of such vital importance to the war effort.

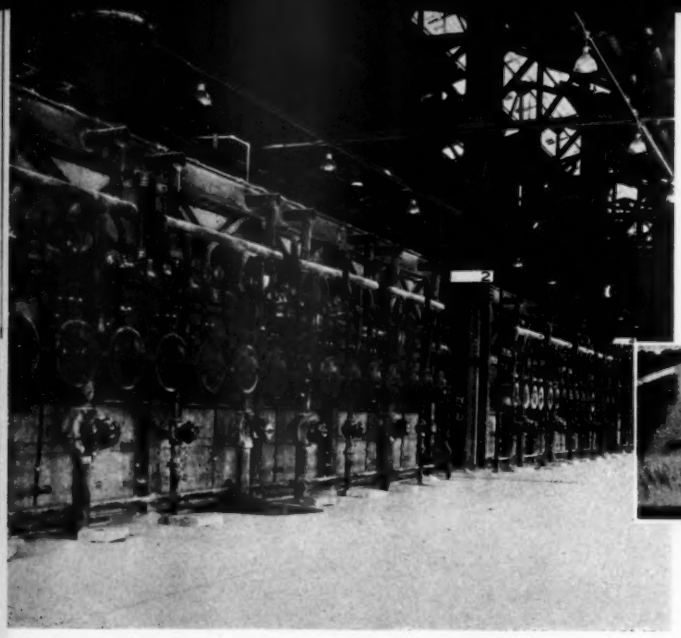
Annual Report Wins Merit Award

A HIGHEST merit award for "distinguished achievement in annual reporting" has been given the Public Service Corporation of New Jersey by the *Financial World* in recognition of its 1942 Annual Report to Stockholders. The certificate states that the Public Service report was judged as being among the most modern from the standpoint of content, typography and format of the 766 annual reports examined during 1943.

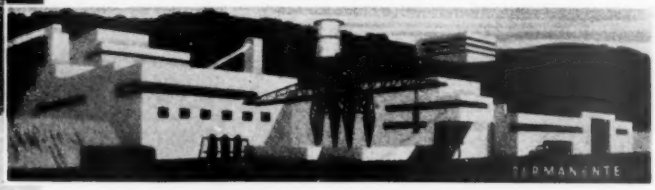
Natural Gas Plays D

By J. H. Gumz

Manager, Commercial and Industrial Sales, Pacific Gas and Electric Co., San Francisco, Calif.



Battery of ovens at the Manteca plant



Giant magnesium plant at Permanente, California

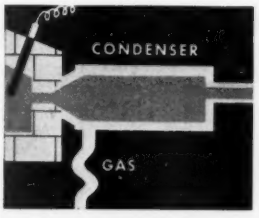
WORLD WAR NO. 2 has brought about a great many changes in what were considered to be firmly established conceptions of design and construction of machinery and equipment. It has also been a spur and incentive to devise new means, materials and design of equipment, which probably would not have been brought about otherwise, except over a long period of time.

The demand for the production of magnesium, because of its many desirable qualities, one of the most important of which is its very light weight, would probably not have come about had it not been for the demands of the present conflict. In the late nineteen-thirties, the annual production of magnesium in the United States was something less than three thousand tons. Today, the production and use has expanded almost one hundred times.

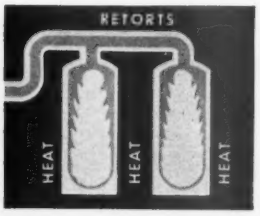
Many articles have been published in the technical trade press recently about the production of magnesium by various processes and it is not intended in this brief article to go over the same ground. In California a large volume of magnesium is being produced annually, and some discussion of the part that natural gas plays in this production may be of interest. Two processes are being used for the production of metallic magnesium and they may be broadly referred to as the carbothermic and the ferrosilicon (or silicothermic) processes. The applications of gas in these two processes is rather unique because of the opposite roles which gas plays. In the carbothermic process it is used as a shock chilling agent and in the ferrosilicon it is used as a fuel to produce furnace temperatures of 2000°F. upwards.

Henry Kaiser, who has been justly credited with being the guiding and inspirational spirit behind many innovations in the shipbuilding program of the United States, has also been intimately connected with the building of plants for the production of magnesium in California. In northern California there are four separate and distinct plants closely correlated for the production of magnesium by the carbothermic and the ferrosilicon processes. Three of these plants are supplied with natural gas by the Pacific Gas and Electric Company but the fourth plant is located in an area where gas is not available. For obvious reasons, the descriptive information and operating data which can be given in connection with these plants is rather limited, but a description of the operations so far as gas is concerned is permissible.

In the carbothermic process the metallic magnesium vapor coming from electrically operated furnaces is instantly chilled in a minute fraction of a second by means of a blast of gas. When this process was developed several years ago in Europe, hydrogen was used as a cooling agent because it had been definitely established that the reverse action of oxygen combining with magnesium took place very rapidly. The chilling of finely divided magnesium from high temperatures such as are present in electric furnaces required that the operation be extremely fast and be carried on in an atmosphere with a minimum content of oxygen. Mr. Kaiser's Permanente Cement Company was using natural



The carbothermic process reduces magnesium oxide with carbon in an electric furnace thus freeing magnesium as a vapor. This is "shock chilled" by suddenly lowering the temperature to 390° F. with a stream of natural gas. Thus magnesium is captured before it can re-combine with oxygen. CO passes off as a gas and magnesium condenses as a fine powder.



In the next step, magnesium powder is compressed into briquets, which are fed into huge air-tight retorts. The retorts are lowered into furnaces, the gas is exhausted, and the metal is distilled in a vacuum, leaving all impurities behind. Pure magnesium collects as a thick crust of beautiful silvery crystals on the cool upper walls of the retorts.

ys Dual Role in Kaiser Magnesium Plants

gas for the firing of several cement kilns and this use presented an excellent opportunity to take advantage of a large volume of natural gas as the cooling agent in the production of magnesium in a carbothermic plant. Such a plant was built and after many disheartening difficulties production was finally developed and, today, huge quantities of magnesium are being produced for use in aeroplane construction and in the production of supplies for the Ordnance Department.

Details of the application of gas cannot be disclosed, other than that some fifteen or twenty million cubic feet of gas daily pass through the magnesium plant on the way to the cement plant. The natural gas itself is not consumed but, as a matter of fact, the gross volume of the gas leaving the magnesium plant is increased due to the addition of some carbon monoxide which is produced together with the production of metallic magnesium in the electric furnaces. The B.t.u. value per cubic foot of the mixture is lowered about 70 B.t.u. due to the addition of the carbon monoxide.

Separate Plant Uses Natural Gas

At an entirely separate plant, natural gas is also used for the production of magnesium by the ferrosilicon process. The final stage of this process takes place in retorts which are heated under vacuum in furnaces to temperatures of approximately 2000°F. Metallic magnesium vapors are condensed as practically pure magnesium metal. There are several plants in the United States utilizing this process, and various furnace designs and burner applications have been developed by the companies operating the plants. From such information as is available, all of these plants are using either manufactured, natural, blast furnace or coke oven gas.

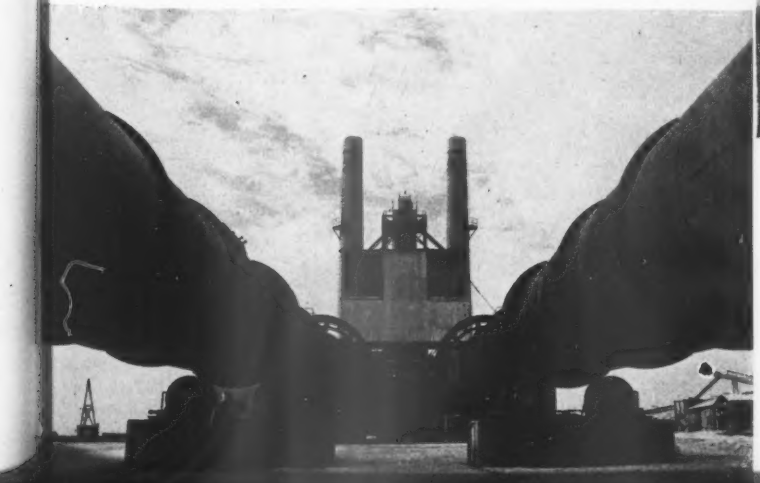
Designs of furnaces in general are similar, some of them expanding more than others in pre-heating methods and control. In the main they consist only of a firing chamber in which the retorts are sealed in horizontal position. Both horizontal and vertical firing applications have been successful in maintaining furnace temperatures without too much variation in the temperature gradient. This process, being of a batch type operation, requires a minimum of control equipment for the reason that conditions are relatively constant and regular. Furnaces are held at operating temperatures continuously so that variations which do occur are caused by loading and unloading at regular intervals.

The ferrosilicon reduction plant in California is owned by the Defense Plant Corporation and is operated by The Permanente Metals Corporation. This plant has 64 furnaces, each approximately 34′ long, 10′ wide and 10′ high. The furnaces are constructed of insulating refractories and are so massive that it is possible to maintain practically uniform temperatures manually, without resort to elaborate temperature control equipment. This, of course, is partially made possible through the application of gas in the burners so that the heat from the burning gas is liberated uniformly throughout the entire volume of each furnace.

It is quite generally known that furnaces operated at elevated temperatures continuously will have a rather high heat loss through the walls, regardless of the amount of insulation which may be used. At this magnesium production plant the 64 furnaces are housed in two long buildings, each containing 32 furnaces in two rows of 16 each. Obviously, the temperature surrounding these furnaces is rather high and, during the summer months, when outside temperatures may rise to 95° and 100° F., the temperatures in the furnace buildings are extremely high. This condition has an interesting result but is one which has not yet been definitely proven. Although the plant has been in full operation for a number of months, the gas usage during July and August was materially less than in February, March and April. The explanation for this may be that the radiation losses due to higher air temperatures in the furnace

(Continued on page 420)

General view of Natividad plant, The Permanente Metals Corporation. Here dolomite is mined, and calcined to produce calcined dolomite for shipment to the seawater magnesia plant at Moss Landing. Here, in turn, the calcined dolomite is processed with seawater to produce magnesium oxide for use in making magnesium at the main plant at Permanente



Kilns at the Natividad plant

NEW MEMBERS OF THE A.G.A.

GAS COMPANIES

	Delegates
Colorado Springs Dept. of Public Utilities	H. A. Galligan
Guthrie Gas Utilities Company, Guthrie, Oklahoma	Merle W. Bahan
Holyoke Gas & Electric Dept., City of, Holyoke, Massachusetts	J. J. Kirkpatrick
Lea County Gas Company, Ysleta, Texas	C. C. Tucker
Northwestern Illinois Utilities, Savanna, Illinois	Ivan A. Shaver
Piedmont Gas Company, Hickory, North Carolina	J. D. Barnes
Public Utilities Commission of Kitchener, Kitchener, Ontario	O. C. Thal
The River Gas Company, Marietta, Ohio	H. B. Schum
Ypsilanti Gas Department, City of, Ypsilanti, Michigan	L. A. Seamans

ASSOCIATE COMPANY

Pritchard & Company, J. F., Kansas City, Missouri	H. Arthur Martin

INDIVIDUAL MEMBERS

Edward E. Bangs	New Bedford Gas & Edison Light Co., New Bedford, Mass.
G. Elton Barnes, Jr.	Southern California Gas Company, Los Angeles, Calif.
H. R. Berkenstock	Roberts & Mander Stove Company, Hatboro, Pa.
J. A. Brentton	Southern California Gas Company, Los Angeles, Calif.
Robert M. Bussard	Natural Gas Pipeline Company of America, Chicago, Ill.
Hy Byrd	Panhandle Eastern Pipe Line Company, Chicago, Ill.
Benjamin Chappel	Canadian National Railways, Saskatoon, Sask.
Rudolph E. Chatel	Middle West Service Company, Chicago, Ill.
Cornelius M. Cosman	H. A. Brassert & Company, New York, N. Y.
J. P. Dieter	Columbia Engineering Corporation, Columbus, Ohio
John F. Drake	The Lattimer-Stevens Company, Columbus, Ohio
Linn Edsall	Philadelphia Electric Company, Philadelphia, Pa.
C. Kenneth Eilerts	U. S. Bureau of Mines, Bartlesville, Okla.
Charles L. Elliott	Cincinnati Gas & Electric Company, Cincinnati, Ohio
F. H. Faust	General Electric Company, Bloomfield, N. J.
Reginald Fleming	Marsh & McLennan Inc., New York, N. Y.
Maurice A. Ford	The Detroit Edison Company, Port Huron, Mich.
Jack Gaddess	North Penn Gas Company, Port Allegany, Pa.
Harry Greve	The Greenwich Gas Company, Greenwich, Conn.
Earl L. Griffith	Consolidated Edison Co. of New York, Inc., New York, N. Y.
Edwin J. Hammer	Michigan Consolidated Gas Company, Detroit, Mich.
T. G. Hangey	Roberts & Mander Stove Company, Hatboro, Pa.
C. N. Hardin	Southern California Gas Company, Los Angeles, Calif.
H. B. Hays	North Shore Gas Company, Waukegan, Ill.
H. D. Heiby	Columbia Engineering Corporation, New York, N. Y.
Elmer K. Higley	Middle West Service Company, Chicago, Ill.
John S. Holt	Stone & Webster Service Corporation, New York, N. Y.
Louis G. James	Lone Star Gas Company, Dallas, Texas
E. A. Jamison	Phillips Petroleum Company, New York, N. Y.
James D. Jones	Colorado Interstate Gas Company, Colorado Springs, Colo.
Frank L. Kay	Westchester Lighting Company, Mt. Vernon, N. Y.
Harold M. Kopp	The Connecticut Light & Power Company, Waterbury, Conn.
Frank P. Lamb	Washington Gas Light Company, Washington, D. C.
H. S. Lillie	Southern California Gas Company, Los Angeles, Calif.
Jesse R. Lowe	City of Corpus Christi, Gas Department, Corpus Christi, Tex.
George T. Macbeth	14 Brookside Circle, Bronxville, N. Y.
C. Ellison Martin	Central Pennsylvania Gas Company, Bellefonte, Pa.
Frank T. McEvoy	New York Power & Light Corporation, Albany, N. Y.
Alan H. Meldrum	Algoma Steel Corporation, Ltd., Sault Ste. Marie, Ontario
R. O. Metcalfe, Jr.	Southern California Gas Company, Los Angeles, Calif.
Donald J. Miller	Public Service Company of Colorado, Denver, Colo.
Charles F. Mundor	1605 Virginia Avenue, Hagerstown, Md.
George M. Nash	Central Hudson Gas & Electric Corporation, Poughkeepsie, N. Y.
John F. Nash	New York & Richmond Gas Company, Staten Island, N. Y.
Charles H. Newton, Jr.	Public Service Company of Colorado, Denver, Colo.
Dan A. Nielsen	Michigan Consolidated Gas Company, Muskegon, Mich.
Reginald P. Oliveros	Semet Solvay Engineering Corporation, New York, N. Y.
Mrs. Lemabel C. Parry	The Peoples Natural Gas Company, Pittsburgh, Pa.
Russel M. Perkins	Windsor Gas Company, Limited, Windsor, Ontario
George H. Pickett	Southern California Gas Company, Pasadena, Calif.
L. Irving Pollitt, Jr.	Pennsylvania Power & Light Company, Allentown, Pa.
James F. Preish	Michigan Consolidated Gas Company, Detroit, Mich.
David W. Price	The Connecticut Light & Power Company, Waterbury, Conn.
Miss Nell Read	City Public Service Board, San Antonio, Texas
R. L. Ream, Jr.	State Corporation Commission of Kansas, Wichita, Kans.
Charles W. Robinson	New York & Richmond Gas Company, Staten Island, N. Y.
Oscar F. Rogers	North Shore Gas Company, Waukegan, Ill.
William C. Royal	Citizens Gas Fuel Company, Adrian, Mich.
Forrest S. Rutherford	Republic Steel Corporation, Washington, D. C.
John S. Sheffield	Arkansas Natural Gas Corporation, Shreveport, La.
Gilbert R. Smith	Southern California Gas Company, Los Angeles, Calif.
James P. Stephens	Cincinnati Gas & Electric Company, Cincinnati, Ohio
Joseph T. Stine, Jr.	New Orleans Public Service Incorporated, New Orleans, La.
Frank A. Sullivan	The Por-Oxide Company, Elizabeth, N. J.
Joseph F. Verderber	Southern Counties Gas Company, Los Angeles, Calif.
V. D. Ward	Southern California Gas Company, Lancaster, Calif.
F. W. Warner	The Barrett Division, Allied Chemical & Dye Corp., New York, N. Y.
Theodore G. Weber	Consolidated Edison Company of New York, Inc., New York, N. Y.
W. Frank White	Southern California Gas Company, Los Angeles, Calif.
Fairchild Whitworth	Sprague Meter Company, Bridgeport, Conn.
Channing W. Wilson	Consolidated Gas Electric Light & Power Company, Baltimore, Md.
Harry D. Wilson	Michigan Consolidated Gas Company, Muskegon, Mich.
Thomas F. Wolfe	The Cast Iron Pipe Research Association, Chicago, Ill.
Ben. F. Worley	United Gas Corporation, Houston, Texas
Hillis J. Youse	E. I. du Pont de Nemours & Company, Inc., Charleston, W. Va.

Display Tie-Up with National Gas Ads

TO enable companies to utilize their window space to tie-in with the new series of national gas ads for 1943-44, arrangements have been made with the Bishop Publishing Company whereby that organization will produce displays carrying out the same illustrative and copy themes found in the national ads.

While it is too late to prepare displays for the first ad, the second and third ads scheduled for appearances in November and December will initiate the new series which will be made a regular part of the Bishop service to utility companies. All correspondence in reference to these displays should be addressed to Bishop Publishing Company, 427 West Randolph Street, Chicago 6, Illinois.

Educational Program to Aid Conservation

John A. Robertshaw

JOHN A. ROBERTSHAW, president of Robertshaw Thermostat Company, announced that the company has inaugurated a unique educational program having the two-pronged objective of aiding the war effort currently while building future goodwill for the company and for the range manufacturers it serves.

The Robertshaw Company is addressing homemakers direct through the medium of women's interest programs on leading radio stations in metropolitan markets from coast to coast. "The eminent conductors of outstanding women's programs," Mr. Robertshaw explained, "are telling homemakers of the importance, in these wartime days particularly, of using correct oven temperatures to avoid waste of food and fuel.

"For example, outstanding radio personalities in the field of women's service are pointing out how the proper control of oven heat can prevent excessive shrinking of precious meat and how proper setting of oven heat controls can prevent overcooking or under-cooking with its resultant food waste.

"Prominently featured over the air," Mr. Robertshaw continued, "are suggestions as to how a complete meal can be cooked in the oven at the same time and at the same controlled temperature. The subjects touched on above are but an example of the many relating to the practical operation of gas and electric range ovens which will be brought to the attention of millions of housewives throughout the country through the new educational campaign," Mr. Robertshaw said.

Solder has been salvaged from these junked meter parts

Immersing meter parts for desoldering

"Skeleton" meters stacked, ready for desoldering

Desoldering Gas Meters with Hot Oil*

By G. E. GRIFFIN, JR., *Supt., Meter Repair Division, The Brooklyn Union Gas Company*

FOR the past year and a half, the restrictions placed by the War Production Board on the use of tin solders have been the principal problem of the tin meter man. As these restrictions appear to be confined to the use of new material, it has become increasingly important that we avail ourselves of every bit of reclaimed solder at our disposal.

With this thought in mind, The Brooklyn Union Gas Company has developed a method for stripping solder from condemned meters. The details were released at the time operations first were started, but it might be of interest at this time to review our experience to date.

The basic principle of the operation is simple. The meters to be desoldered are placed in wire baskets and immersed for approximately three minutes in an oil bath heated to a temperature of 500° F. As 50-50 solder melts at a temperature of approximately 425° F., the solder flows from the parts while immersed in the bath and precipitates to the bottom of the tank.

The equipment necessary for such an operation need not be expensive. It can be improvised from industrial equipment in stock or fabricated if one has some steel plate and a handy mechanic. In our case a deep fat fryer was used. Approximately one drum of oil is sufficient for operation in such a tank and there is room for three wire baskets each of which is large enough to contain a 5 lt. meter. For temperature control, a No. 40 K 9 Partlow Thermostat is used. As there is a certain amount of fuming in high temperature oil operation, a draft hood and fan are required.

Care must be exercised in selecting the proper oil for use in this operation. A good grade of tempering oil having a flash point of approximately 630° F. is required. This should be a straight mineral oil rather than a combination of vegetable and mineral as the flash point of the straight oil will stand up better under constant heating. It is well to make open cup flash tests every few days as a safeguard against a breakdown in the flash point. Our experience to date has been that the flash point of the oil will drop due to contamination of the oil rather than because of constant heating.

Meters must be opened before they can be desoldered. Condemned meters generally fall into two categories. There are "skeleton" meters which are condemned after they have been opened and washed, and there are "full" meters which have been condemned on sight due to age, type, or condition. To prepare these "full" meters for desoldering, the cases are chopped off, the flag rods cut, and the diaphragms and discs pried out. The top is not removed but a hole is punched in the side above the valve table for drainage. The meters are then washed and permitted to dry for several days before desoldering. To cut the cases from these "full" meters we built a two-blade chopping machine. However, if the quantity of meters to be prepared is not too great, an ordinary hatchet will do a satisfactory job.

Approximately 1200 "full" meters can be desoldered before it is necessary to change the oil in the bath. How-

*This simple and effective process of reclaiming solder was discussed at the A. G. A. Distribution Conference in Cincinnati, April 29-30, and also was described in an article in the July-August "Flow Line," published by Merco Nordstrom Valve Co., and Pittsburgh Equitable Meter Co.

ever, if skeleton meters are being desoldered, you can do almost twice as many before changing the oil. This is due to the fact that the latter meters are generally much cleaner. The actual basis for changing oil is the flash point. It will be found that as the oil becomes contaminated, the flash point will drop. In our situation, we change oil when the flash point has dropped to 530° F. The discarded oil is sent to our pipe yard where it is used to coat pipe to prevent corrosion during storage.

The solder yield from the desoldering process is better than two pounds per meter and the analysis runs somewhat as follows:

	Skeleton Meters	*Full Meters*
Tin	55¼%	49%
Lead	43	44
Antimony	1¾	7

The higher antimony content in the solder from full meters is due to the white metal parts in the upper portion of the meter. Due to this antimony content, we have seen fit to have our reclaimed solder resmelted by the National Lead Company. A certain amount of antimony is beneficial in solder but it must never exceed 7% of tin content. We have been having this solder resmelted as 38% tin, 2% antimony, and 60% lead, and results have been quite satisfactory.

We have experimented with a number of methods for removing the solder from the tank. The most satisfactory of these methods consists of scooping the molten solder from the bottom of the bath and pouring it into iron moulds to form pigs weighing approximately 35 pounds each. This facilitates handling and stacking.

It is possible to salvage a certain

(Continued on page 420)

Advertising that Boosts the Old Home Town

By A. G. SCHROEDER

Ass't General Manager, Michigan Consolidated Gas Co., Grand Rapids, Mich.

HOW a utility can develop good-will for itself and community pride in residents by calling attention to the distinctive assets of a city is illustrated by a campaign of newspaper advertising being currently carried on by the Grand Rapids District of the Michigan Consolidated Gas Company.

The theme of the series is "In Appreciation of Grand Rapids" with a sub-line reading "Lest We Forget the Many Fine Things About Our City." The ads are uniformly four columns wide and ten inches high, with a decorative border and fine pen drawings which lend character and attention value to the series. The copy in each advertisement devotes itself exclusively to some particular advantage of the community to which citizens may point with pride, and the only commercial reference is a decorative shield design in one corner which reads, "Natural Gas—Another Advantage to Living in Grand Rapids." The only signature is one modest line at the bottom reading, "Published by the Gas Company as a Matter of Civic Pride."

All communities have features of which the citizens may be proud, but "familiarity breeds contempt," and people fall easily into the habit of knocking the old home town. This particular utility believed it would be in the public interest to remind Grand Rapids people of the many distinctive advantages of "The Furniture City," and that it is more fun to boost than to knock.

At present Grand Rapids is busy and prosperous, and its war plants are begging for 4000 additional workers, but when the series started some plants were idle, there was some unemployment, some workers were leaving town, and there was an undercurrent of criticism and knocking. It was good timing to inaugurate the series at that moment, and there is plenty of evidence that these weekly messages in the daily papers stimulating civic pride have had a good influence.

A gas company is so inseparably linked up with the prosperity and well-being of the community it serves that such a series was a natural. Grand Rapids is not only the second city of Michigan, but "the Fine Furniture Capital of America" and the "Gateway to the Summer Playground of the Nation." The ads have featured such a variety of subjects as the city's Symphony Orchestra, one of the finest among the smaller cities of America; the internationally famous Furniture Museum; the $2,800,000 airport which holds the all time safety record of all airports in the U. S. A. in never having had a fatal accident; the leadership of the city in home ownership, and so on. One advertisement of particular timeliness corrected a widespread misunderstanding that Grand Rapids is largely a furniture manufacturing city, by showing that its 27 furniture factories comprise but one of 120 different types of manufacturing establishments in the city.

The gas company follows up the appearance of the ads in the papers by mailing proofs to civic leaders, and by making giant enlargements in colors which are displayed in the Chamber of Commerce offices, in banks and in the company's own showrooms. This fall they will be used as educational exhibits in the public library and schools, with an essay contest for students on why Grand Rapids is a good place in which to live.

Improved Apparatus . . . *for the Rapid Determination of Carbon Monoxide*

Louis Shnidman

PART I

By LOUIS SHNIDMAN

Rochester Gas & Electric Corporation, Rochester, N. Y.

- **In Part I, herein presented, a brief summary of the properties and physiological behavior of carbon monoxide is presented, likewise various general procedures for the determination of carbon monoxide are considered, followed by the development of a portable apparatus.**
- **In Part II to follow, a detailed description of the apparatus, the procedure for analysis, experimental results on synthetic mixtures, effect of other gases, properties of reagents, and calculations, are considered.**
- **Mr. Shnidman's paper was first presented at the Association's Production and Chemical Conference in New York last May.**

CARBON monoxide (CO) at ordinary temperature is a colorless, odorless and tasteless gas. It is highly poisonous, inducing asphyxiation. It is somewhat lighter than air having a specific gravity of 0.967; diffusing readily, becoming an intimate part of any gas mixture. It is only slightly soluble in water, 2.19 volumes dissolving in 100 volumes of water at 77° F.-Carbon monoxide is one of the more permanent gases boiling at —190° C. (—310° F.), showing a critical temperature of —140° C. (—220° F.) and a critical pressure of 35.5 atmospheres. It forms explosive mixtures with air, the lower limit being 12.5 per cent and the upper limit 74.2 per cent by volume, respectively. Carbon monoxide burns readily in air with a blue flame to form carbon dioxide with the evolution of heat, but it does not support combustion.

Carbon monoxide is seldom found free in nature. It is formed in many industrial, commercial and domestic operations resulting from the oxidation of carbon-containing material. It is present in the products of combustion of gaseous, liquid and solid fuels when the conditions of combustion are not properly controlled.

The physiological effects of carbon monoxide are rather marked and sudden, relatively small concentrations of the gas being required. Carbon monoxide is a blood poison, i.e., it combines with the hemoglobin in the blood forming a stable compound, carbon monoxide hemoglobin, which causes internal asphyxiation since the hemoglobin is no longer able to absorb oxygen and deliver it to the tissues. Hemoglobin shows an affinity for carbon monoxide of some 300 times greater than that for oxygen, and rapidly absorbs it from any atmosphere containing even small amounts.

Table I shows the physiological effects when the blood is saturated with varying percentages of carbon monoxide.

Table II presents the physiological effects when the concentration of carbon monoxide in air varies over a given range.

The American Standards Association Standard "Allowable Concentration of Carbon Monoxide"[1] states that "the maximum allowable concentration of carbon monoxide shall be 100 parts per 1,000,000 parts of air by volume with atmospheric oxygen not below 19 per cent by volume for exposures not exceeding a total of eight hours daily and shall be 400 parts per 1,000,000 parts of air by volume for

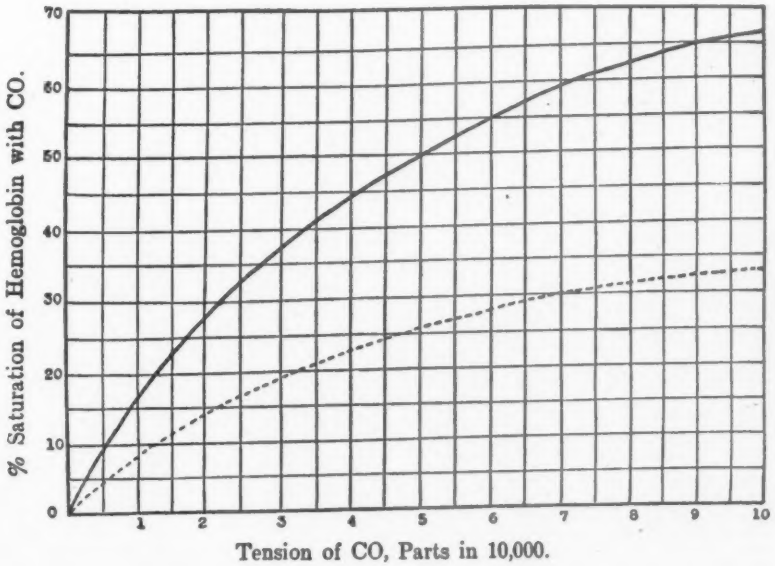


Fig. 1—Carbon monoxide equilibrium curve of blood (solid line) after long exposures, as determined by Haldane; and curve for maximum degrees saturation attainable in one hour during rest, as determined by Henderson and Haggard (broken line)

exposures not exceeding a total of one hour daily."

Figure I presents the carbon monoxide equilibrium curve of blood in an atmosphere of carbon monoxide of various concentrations.

Since carbon monoxide is a constituent of many of the manufactured fuel gases and may become a constituent in the products of combustion of all types of fuels, gas, liquid or solid, it is important that a simple, accurate and reliable method for the rapid determination of carbon monoxide for any type of atmosphere be available. Such a method will be of value in helping to design, adjust and operate appliances to secure proper combustion. It will also aid in discovering the presence of carbon monoxide from any source, and thereby reduce such hazards.

TABLE I*

% Carbon Monoxide Hemoglobin	*Physiological Effects*
10	No appreciable effect, except shortness of breath on vigorous muscular exertion.
20	No appreciable effect in most instances, except shortness of breath, even on moderate exertion; occasionally slight headache.
30	Decided headache; irritable; easily fatigued; judgment disturbed.
40 to 50	Headache; slight confusion; collapse and fainting on exertion.
60 to 70	Unconsciousness; respiratory failure and death if exposure is long continued.
80	Rapidly fatal.
Over 80	Immediately fatal.

TABLE II*

Parts of Carbon Monoxide per Million Parts of Air	*Physiological Effects*
100	Concentration allowable for an exposure of several hours.
400 to 500	Concentration which can be inhaled for 1 hour without appreciable effect.
600 to 700	Concentration causing a just appreciable effect after exposure of 1 hour.
1,000 to 1,200	Concentration causing unpleasant but not dangerous symptoms after exposure of 1 hour.
1,500 to 2,000	Dangerous concentration for exposure of 1 hour.
4,000 and above	Concentrations which are fatal in exposures of less than 1 hour.

Detection and Determination of CO in Gas Mixtures

It is desirable to discuss briefly the various general procedures available for the detection and determination of carbon monoxide in gas mixtures before considering the apparatus finally developed.

The usual gas volumetric methods for the determination of carbon monoxide include absorption with either acid or ammoniacal cuprous chloride, reduction of cuprous oxide to copper, and the like. These procedures are most satisfactory for determination where the particular sample of gas contains appreciable quantities of carbon monoxide. Small quantities or traces of carbon monoxide in a gaseous atmosphere are best determined by special procedures, a number of which are indicated briefly in what follows:

For the qualitative detection of carbon monoxide the use of palladium chloride affords a simple and rapid procedure. The method is based upon the well-known fact that when carbon monoxide is passed through palladium chloride solution, palladium is precipitated according to the following reaction:

$$PdCl_2 + CO + H_2O = Pd + CO_2 + 2HCl$$

Various modifications have been studied in an attempt to make this method quantitative. In some cases palladium

* From Henderson and Haggard, "Noxious Gases" published by Reinhold Publishing Corp., New York, N. Y., 1943.

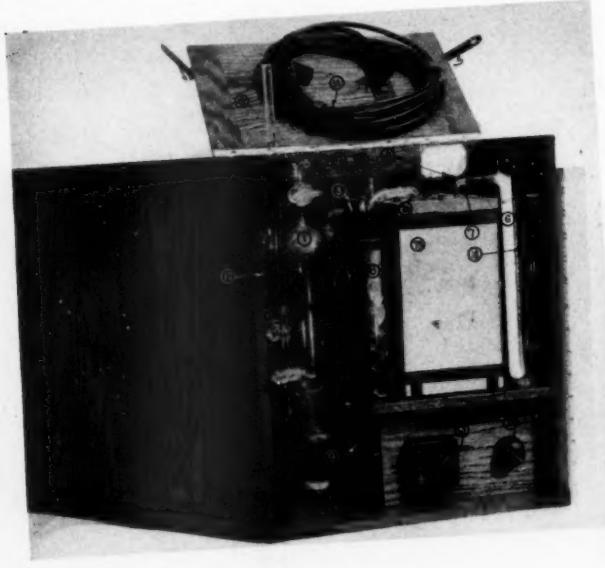
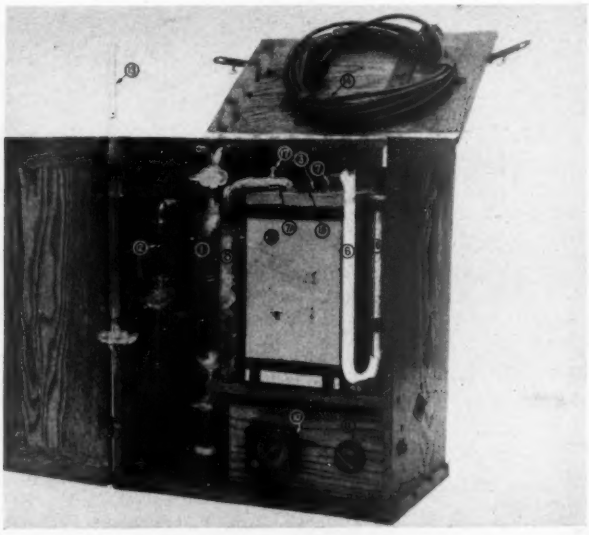


Figure 2

Figure 3



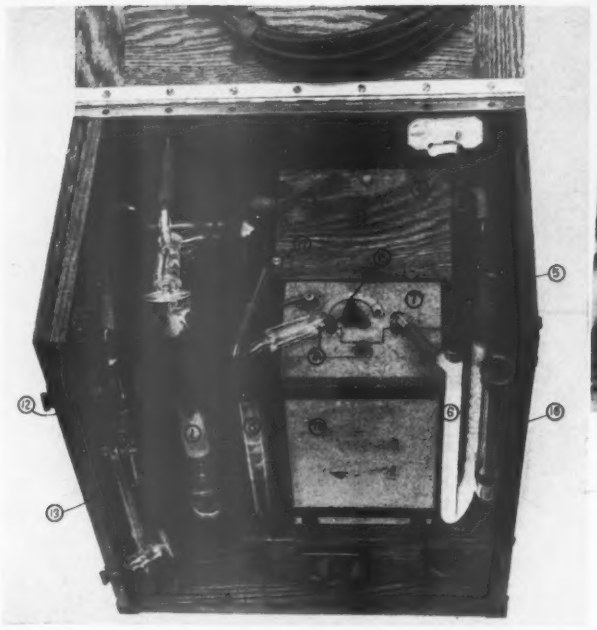


Figure 4

Figure 5

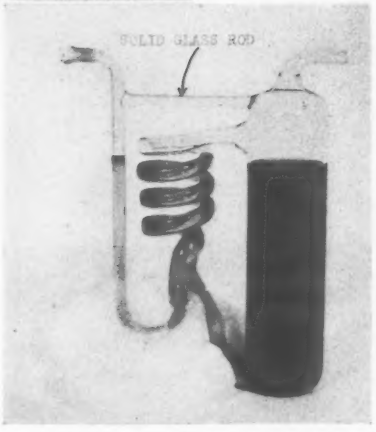


Figure 6

chloride impregnated paper is used. Labat[2] described an improved procedure for the preparation of the palladium chloride paper. In the United States the ampoule detector was developed[3] consisting of a cotton-covered, thin-walled, glass tube approximately 1½ inches in length and 3/16 inch in diameter. It is filled with a solution of palladium chloride in a water-acetone mixture and hermetically sealed. The procedure for using the detector is to crush the ampoule, wetting the cotton with the palladium solution, then to expose it for 10 minutes to the air to be tested. If carbon monoxide is present, it reacts with the palladium chloride and changes the color of the ampoule from the brownish-yellow stain of the solution through yellowish black to black through a range of 200 to 1000 parts per million depending on the concentration of carbon monoxide. Other gases such as gasoline, ethylene, hydrogen, and hydrogen sulphide change the color of the ampoule, and their absence must be known if accurate carbon monoxide findings are to result.

Winkler[4] has used the palladium chloride method for carbon monoxide determination by dissolving the precipitated palladium in an excess of bromine to form palladium bromide, and then determining the excess of this reagent.

Christman, Block, and Schultz[5] reacted palladium chloride with carbon monoxide and determined the excess palladium chloride after filtering, by treatment with potassium iodide to produce palladium iodide which is determined colorimetrically.

The South Metropolitan Gas Company of London[6] has adopted the palladium chloride method for the quantitative determination of low concentrations of carbon monoxide. For details reference should be made to the original article.

Another semi-quantitative detector is the so-called "Hoolamite" Indicator for carbon monoxide.[7, 8] It is a small hand-operated device consisting of a tube of activated charcoal through which the gas is drawn by means of a rubber hand bulb; this then discharges through a small glass tube containing the "Hoolamite," a white or light gray, granular substance composed of iodine pentoxide and fuming sulphuric acid on pumice granules. At ordinary temperatures carbon monoxide is oxidized by the "Hoolamite," and iodine is liberated in the process. This colors the granules through increasing shades of bluish green, then brownish purple, or black, according to the concentration of the carbon monoxide. A comparison of the shade of blue-green produced with a permanent color scale placed along side the active tube enables one to estimate the concentration of the carbon monoxide from a lower limit of 0.07 per cent to 1 per cent or more.

The reaction of carbon monoxide with blood has been used as a means for determining it in various atmospheres. The method (called the pyrotannic acid method)[9, 10, 11, 12, 13] is based on the fact that a light brownish gray suspension is formed in a few minutes when normal blood diluted with water is treated with a mixture of tannic and pyrogallic acids, either in solid form or in solution; whereas a light carmine suspension is formed with the same reagents in blood having carbon monoxide in combination with the hemoglobin. When compared with standards made to match the color of different known amounts of carbon monoxide hemoglobin, the percentage

of saturation of the latter may be ascertained. The accuracy of the method may be as low as 0.01 per cent. If not performed under carefully controlled conditions, this method can give results that vary quite widely.

The catalytic oxidation of carbon monoxide to carbon dioxide utilizing the heat of reaction as a means of detection has formed the basis of indicating, recording and alarm systems.[14, 15] They are all based on the same principle. Air to be analyzed is passed through a cell containing a catalyst, hopcalite,[16] which oxidizes the carbon monoxide to carbon dioxide with the liberation of heat. The heat so liberated is directly proportional to the carbon monoxide present and is measured by a series of thermocouples wired to the indicating, recording or alarm system. These systems show a high degree of accuracy and are capable of continuously showing the presence of .01 per cent carbon monoxide for the indicator, .005 per cent for the alarm, and .001 per cent for the recorder. The M.S.A. carbon monoxide indicator, alarm and continuous recorder are operated on these principles.*

Thermal-conductivity has also been used to a limited extent in special studies for determining the carbon monoxide content of the gas mixture,[17, 18] but has not been adopted generally.

Iodine pentoxide has formed a basis of a number of accurate procedures for determining the carbon monoxide content in various types of gaseous atmospheres.[19, 20, 21, 22] They are based on the reaction that when carbon monoxide is passed over iodine pentoxide, at an elevated temperature of 90° to 150° C. (194° to 302° F.), carbon dioxide and iodine are liberated according to the reaction:

$$I_2O_5 + 5CO \rightarrow 5CO_2 + I_2$$

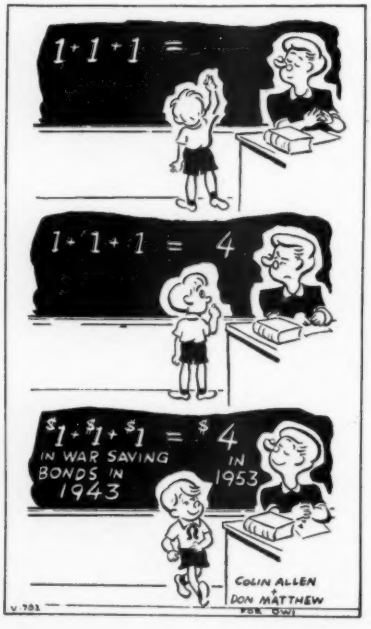
The determination of either carbon dioxide or iodine has been used as a measure of the carbon monoxide content of the atmosphere in question. The iodine pentoxide method has been adopted as the standard procedure by the American Standards Association. The portable apparatus developed and described in this paper employs the iodine pentoxide reaction.

Where the conditions were such that the above methods or procedures were not applicable, specialized methods have been used for the determination and detection of carbon monoxide. These include reaction of carbon monoxide with the noble metals,[23, 24, 25, 26] oxidation of carbon monoxide,[27] absorption of carbon monoxide by hemoglobin and the like.[28, 29]

References to other methods for carbon monoxide can be found in Drinker,[30] in Berger and Schrenk,[31] in Ambler,[32] and in the Gas Chemist's Handbook.[33]

Development of a Portable Iodine Pentoxide Apparatus

In 1928 our laboratory was confronted with the problem of determining the presence of small quantities of carbon monoxide, that is, less than 0.1 per cent in various types of gas mixtures. Since the usual Orsat-type apparatus will show the presence of carbon monoxide only within 0.1 to 0.2 per cent, some other method and apparatus was required. Accordingly, a search of the literature for suitable methods was conducted. A study of the available procedures for the determination of traces of carbon monoxide was made. A brief discussion of some of these procedures has been presented in an earlier part of this paper.



We were interested in securing or developing an apparatus that would be suitable for analyzing various types of gas mixtures; one that could determine quantitatively traces of carbon monoxide which might occur from leaks about the plant; in atmospheres of enclosed plant equipment where men would be required to make repairs; in combustion products from various types of apparatus and equipment for a check of their efficiency; and in the atmosphere and flue products from gas equipment on consumers' premises relative to leaks or improper combustion. After due consideration of the various procedures available, it was decided that an apparatus based upon the reaction of carbon monoxide with iodine pentoxide would be best adapted for our purposes.

$$I_2O_5 + 5CO \rightarrow 5CO_2 + I_2$$

Previous studies by other investigators including Berry[34] of the U. S. Bureau of Standards, Burrell[35] of the Bureau of Mines, Davies and Hartley,[20] and others have shown that the iodine pentoxide procedure was capable of detecting and determining traces of carbon monoxide to a high degree of accuracy. The various procedures developed differed mainly in the system for purifying the gas to remove interfering constituents, the temperature at which the iodine pentoxide was maintained, the method for purging the apparatus, and in the procedure adopted for determining the amount of carbon monoxide present; i.e., whether the iodine liberated or the carbon dioxide formed was measured.

With these basic ideas in mind a portable apparatus was developed in the early part of 1929. The apparatus consisted of a 200 ml. sampling tube and leveling bottle, a purifying train containing concentrated sulphuric acid, chromic acid, and calcium chloride, a small iodine pentoxide tube immersed in oil in a thermos bottle and heated electrically, potassium iodide absorption tube, followed by a second 200 ml. container and leveling bottle. All the equipment was housed in a wooden container approximately 12 inches

(Continued on page 428)

* These instruments are manufactured by the Mine Safety Appliances Company of Pittsburgh, as are also the commercially available detector outfits using pyrotannic acid, Hoolamite and palladium chloride ampoules, which are briefly indicated above.

Manpower Utilization in the Gas Industry

At the request of the War Manpower Commission, the American Gas Association Committee on War Activities conducted a survey of gas companies to determine methods adopted for conservation and the most effective utilization of manpower in the industry. Interesting data resulting from the survey were outlined in the letter reproduced below. These facts are being studied further with a view to keeping member companies informed of the most effective methods of conserving manpower and enhancing the efficiency of its utilization.

AMERICAN GAS ASSOCIATION
420 Lexington Avenue
New York 17, N. Y.

SEPTEMBER 7, 1943

Mr. W. O. W. Lee
Special Industries Division
Bureau of Manpower Utilization
War Manpower Commission
Washington, D. C.

Dear Mr. Lee:

In compliance with the request made in your letter of July 8 addressed to the Managing Director of the American Gas Association, in which you confirmed and elaborated on the conference at American Gas Association Headquarters on June 29, we are writing to acquaint you with the results of a canvass we have made of a cross-section of the gas industry on the subject of conservation and most effective utilization of manpower.

General Results

This canvass reveals extraordinarily successful efforts in enlarging the operations of an industry essential to the war program and to civilian morale in the face of heavy loss of manpower to the Armed Services and to war industries which offer greater compensation. It is evident that manpower utilization has received the closest attention of the executives of the industry. The gas industry is operating today with fewer employees per customer or in relation to sales than ever before.

During the calendar year 1942, the actual number of employees in the industry fell 17,200, a reduction of 12.4% as compared with 1941 in the face of substantial increases in customers served and gas sold. This represents a reduction of 14.7% in number of employees per 100 customers and a reduction of 20.2% in number of employees per million MCF sold. The reports of representative companies covered by this letter indicate that this trend has been further accentuated during 1943. One company reports that it has brought about a reduction of 26% in total employees and 34% of men employees. These figures on this company do not reflect manpower savings from subsequent increase of work hours per week.

Study for Further Reduction Continuous

A reduction in manpower needs has been secured by the persistent search by individual companies, particularly the larger ones, for reports and related clerical activities which can be dispensed with during the war period though they may be conducive to increased efficiency in normal times. A study of such manpower savings discloses that many involve company practices which are not common to the industry as a whole. Companies report the study of methods of operations in the interest of efficient use of limited available manpower is continuous.

Working Hours

The chief means of economizing on manpower has been increasing the work hours per week to 44 and 48 hours. Some of the companies, perforce operating on a 48-hour week, have expressed the belief that a 44-hour week would be better in the interest of efficiency and in the maintenance of employees' health and morale.

Meter Testing, Meter Reading and Billing

In the field of meter testing, meter reading and billing, the results throughout the gas industry are very striking. Some companies estimate that they have saved 10% of manpower through relief permitted by State Commissions and other regulatory authorities in their requirements for periodic testing of gas meters. Not all states have acted, but most of the Commissions have shown a cooperative attitude. It should be remembered that there is involved here not only the time required for testing, but also for repairing and re-setting the meters. Mention is made of saving also of tires and gasoline as a result of longer periods in which a meter is permitted to remain in service without testing.

Many gas companies are now billing their customers quarterly or bi-monthly instead of monthly, which requires monthly estimates, but saves manpower difficult to reduce to actual figures. Office procedures have been simplified and collections and bill delivery practices have been revised to effect reductions in manpower.

Customer Service

Much attention has been paid to advising customers how to do minor repair work and persuading them to defer repairs until after the end of hostilities. Where repairs are absolutely essential, orders are permitted to accumulate for a longer period than formerly until such time as they are sufficient to make full use of manpower in one area.

Companies through advertising and publicity endeavor to obtain customer cooperation in the curtailment and changes of servicing practices in the interest of conservation of manpower. Customers are reported to be most cooperative in this endeavor.

Some of the gas companies believe that if they were permitted to make a charge for servicing formerly free, but which is prohibited by OPA regulations, it would result in fewer repairs and economy of manpower.

Construction and Maintenance

Construction and maintenance work has been reduced to an absolute minimum which has saved much manpower. One company reports its greatly reduced maintenance force must continually work overtime to handle storm damages, equipment failures, war and general maintenance.

Limited Gasoline Supply

Restrictions on the use of gasoline for trucks has brought

(Continued on page 410)

about a corresponding saving in manpower. In order to meet the restrictions, the number of trucks used has been greatly reduced. One company reports a 50% reduction in truck mileage by means of scheduling deliveries, with a probable similar reduction of manpower.

Servicing of Industry

The servicing of the industrial application of gas is extremely vital. Companies in those localities where a large amount of war manufacturing is carried on have been able to advise managers in the direction of efficiency of operation and conservation of fuel so as to accomplish substantial savings in war plants. However, one company has been able to continue satisfactory industrial service in face of a loss of 40% of its men, especially trained and experienced in this highly specialized work, to the armed forces and other war work.

Sales Forces

There is unanimity in reporting that sales forces of some companies are either skeletonized or almost completely eliminated for the duration. Any sales force retained is used exclusively for essential service functions.

Employment of Women

It is also generally agreed that every company has saved considerable manpower by the employment of women. Women are doing work in the gas industry which a few years ago would have been thought to be impossible for them to handle.

Required Government Reports

If it could be found possible to eliminate or to suspend during the period of hostilities many of the reports now required by war agencies, by Federal and State Governmental Commissions and Bureaus, it would obviously save a large amount of manpower which could not be accurately estimated. *There is attached to this communication a detailed suggestion from one company of reports which in their opinion could very well be suspended for the duration of the war without harm to anybody and substantial saving of manpower.

The subject of the conservation and effective utilization of available manpower has been and still is the topic of discussion at many formal and informal meetings of the Association, and of Committee reports and much correspondence.

The survey of the gas industry has convincingly shown us its company units, of necessity—which is the strongest possible motive, have and are still doing everything possible to make the most efficient use of the limited manpower available to them. A few gas companies in the most critical areas are in dire straits because of the dearth of manpower; in fact, the Association has appealed to the War Production Board for help in the case of one company which serves war industries.

Very truly yours,

E. R. ACKER, Chairman
Committee on War Activities

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*Appendix

Doubtless many of the governmental requests for data, statistics and studies could be eliminated without interfering with the prosecution of the war, although much more manpower is being devoted to the compliance with orders and regulations growing directly out of the war. In the latter category are such matters as the administration of materials, the application of OPA price regulations, the withholding tax operations, and the War Manpower Commission and Selective Service requirements; doubtlessly, it would be held that information of this sort is necessary in the conduct of the war.

Among other governmental reports which could probably be suspended for the duration of the war are the following:

Agency	*Report*
Rural Electrification Administration	Annual request for farms served with electricity.
Federal Power Commission	Annual report (Form 1), if the corresponding state regulatory body also agrees. Annual power system statement (new Form 12), and also the monthly supplement thereto (new Form 2-44). High voltage line data (Form 223 and Form 223-A); also transmission lines data (Form 222). All "typical net monthly bill" reports; revisions of rate schedule data for National Electric Rate Book. Annual construction budget and generating capacity report. Annual revision of directory of electric and gas utilities. Monthly report on income and expense; monthly report on electricity generated and fuel consumed.
Securities and Exchange Commission	Annual report under Securities and Exchange Act of 1934 (Form 10-k); and annual report to maintain exemption from provisions of Holding Company Act (Form U-3A-2). (The Securities and Exchange Commission now receives annual reports furnished to security holders, and also receives Form 80K, which keeps previously filed annual reports up to date.)
War Department	Monthly report on water borne commerce. Monthly report on accident statistics.
Bureau of Labor Statistics	Quarterly reports on gas rates for household use; monthly report on gas sales and revenue; annual report on entrance rates of pay for common labor; annual report on employee exposure data (which is now duplicated by the War Department's request).
Bureau of Mines	Annual report on sulphur recovered.
Federal Power Commission and State Public Service Commission	Suspension of work in connection with continuing property records and original cost.

Elimination of these reports would undoubtedly reduce manpower requirements though I am unable to estimate, without considerable further study, the extent of the manpower savings.

Safety Trends

Contributed by the Accident Prevention Committee
Edited by W. T. Rogers, Ebasco Services Inc., New York, N. Y.

COLUMBIA SAFETY REPORT

THE Columbia System Safety Committee has completed its annual report for the year 1942 showing the results of its safety activities.

For the first time in five years, no Columbia System Groups succeeded in attaining first place in any division of the Public Utilities Contest. However, two Honorable Mention Certificates were won by the Columbus Group, one for second place in the Large Gas Companies' Division and one for having the greatest number of continuous manhours of exposure without a reportable accident in its Contest Division.

During the year 1942 there were 201 lost-time accidents which was the lowest number of accidents in any single year since the formation of the accident committee in 1931. During this period the Columbia System also sustained the lowest number of motor vehicle accidents (269) for any year of which they have record. The Pittsburgh Group which led Columbia System contestants in the Large Fleet Section of the Truck Division was awarded a Certificate of Merit for ranking among the top 20% of the fleets competing in its Division.

For the calendar year 1942, Columbia System showed a frequency rate for Lost-Time Industrial Accidents of 7.22 which compares favorably with the frequency rate of 10.05 for all public utility companies reporting to the National Safety Council.

ARTIFICIAL RESPIRATION

TIME Magazine (August 16) has publicized a method of artificial respiration which British naval surgeons consider better than the pressure-and-release system worked out by Sir Edward Sharpey Schafer in 1903.

Dr. Frank Cecil Eve, consulting physician to the Royal Infirmary at Hull, England, originated a system of artificial respiration eleven years ago which is based on a gentle, rhythmic rocking of the patient who is bound (either supine or prone) on a stretcher by gentle wrist and ankle bandages. The stretcher is placed on a fulcrum in such a manner that when rocking is started, the head and feet are alternately down about 50 degrees, a seesaw to be completed every four or five seconds.

The article was brought to the attention of Cecil K. Drinker, M.D., Professor of Physiology in the School of Public Health at Harvard University, by J. W. West, Jr., Secretary of the Accident Prevention Committee, and we quote Dr. Drinker's reply as follows:

"The Eve method is not new and works quite well. I have often advocated it where long-continued artificial respiration was necessary and no respirator was available. Almost anyone can rig up an old door on a trestle and fix a way to fasten a patient to it and then by gentle rocking artificial respiration may be given through many hours and with little or no fatigue to the operators. It is a thoroughly sound maneuver and depends upon the fact that when the body is rotated head down the contents of the abdomen force the diaphragm up, decrease the size of the chest, and the air is expelled. When the foot-down position is gained the reverse situation occurs and air is drawn in.

"I think your colleagues on the Accident Prevention Committee should know this is a sound and simple method for giving artificial respiration which does not attempt to blow anything into a patient or suck anything out but really utilizes much the same principles which are involved in the prone method and has been operated successfully over many hours with actual patients."

WIN McCARTER AWARDS

TEN applications for McCarter awards were approved by the Executive Board of the American Gas Association at its meeting in New York on Sept. 14. The awards are made upon recommendation of the Accident Prevention Committee for outstanding acts of life saving by application of the Schafer prone pressure method of resuscitation. They are given only to those individuals who by their courageous acts have rendered extraordinary service to the industry and humanity.

Following is the most recent honor list of McCarter winners:

McCarter Medal

William L. Magden, North Shore Gas Co., Waukegan, Illinois.

Charles Frederick St. Sauveur, Blackstone Valley Gas & Electric Co., Woonsocket, R. I.

Edward Caslander, Public Service Electric & Gas Co., Paterson, N. J.

George F. Mitzel, The Philadelphia Gas Works Co., Philadelphia, Pa.

Howard Willis, The Brooklyn Union Gas Co. Brooklyn, N. Y.

McCarter Bar

Joseph M. Casey, The Brooklyn Union Gas Co., Brooklyn, N. Y.

Certificate of Assistance

Walter H. Dietmeyer, North Shore Gas Co., Waukegan, Illinois.

George Hodkinson, Blackstone Valley Gas & Electric Co., Woonsocket, R. I.

Edward Joseph Kelley, Jr., Blackstone Valley Gas & Electric Co., Woonsocket, R. I.

Edward Cosgrove, Public Service Electric & Gas Co., Paterson, N. J.

The awards are named after Thomas N. McCarter, chairman of the Board, Public Service Corp. of New Jersey, donor of the medals.

"MENTAL CAUSES" OF ACCIDENTS

A MEMBER company recently reported a serious accident, concerning which the employee involved admitted that he fully understood his orders, knew exactly what he had to do and was entirely familiar with the operations, yet did the wrong thing. The employee had eighteen years' experience with the company, was not intoxicated, and can in no wise explain his actions.

In an endeavor to prevent similar occurrences in the future, the company has held several meetings, especially of the key supervisory forces, and it has been definitely admitted that these times are very severe ones and quite conducive to "mental causes" for accidents. Not only are the usual off-the-job problems facing men, married and single, and those contemplating marriage, but today they also have problems of taxes, draft, rationing, shortages of food stuffs, miscellaneous material, etc.

In describing the method used in attacking this problem, the Safety Director of the company writes:

"It was decided that each supervisory head conduct meetings with his subordinates and review this accident, which fortunately and miraculously resulted in no injury, and counsel them of the dangers that bedevil us on all sides even though we are well-qualified and competent workers. A crude analogy was given to the wonderful works accomplished by the railroads over a long period of time (despite many highway railroad crossing accidents) and it was emphasized that each man should realize that, on a 100% basis, he must devote his entire energy—mental and physical— to the job at hand about 25% of the time.

"These conditions involved in the 25% of the time are when a lineman is in the act of operating a switch, while he is in the 'primary position,' splicing out wires, or when a gas man is in a ditch inserting a plug in the service, operating a gas valve, doing maintenance work on a gas governor, etc. When a man is so engaged, he should do the same thing that the railroads have recommended and as a reminder have posted these 'STOP, LOOK AND LISTEN' white crossing signs, only in our case we recommend that a man should 'STOP, LOOK AND *THINK*.'

"Because of the fact that about three-fourths of every worker's time, even those employed in hazardous occupations, the work consists of preparing for a job, travel-

ing back and forth from the job, getting instructions, etc., a worker can be persuaded that the most dependable worker can only be entirely depended upon 90 or 95% of the time, but that if he takes this precaution of stopping, looking and thinking before each job where hazards really exist, his chances of committing an unsafe act will be greatly reduced."

Obituaries

DR. THOMAS A. MIGHILL*

DR. THOMAS A. MIGHILL, research chemist, died September 14, at his home, 37 Oakwood Road, Newtonville, Mass., at the age of 76. He was widely recognized as the Dean of American gas chemists.

Born in Haverhill, Massachusetts, the son of Thomas and Jane (Downs) Mighill, Dr. Mighill graduated from Haverhill high school and from Amherst College in 1889. He taught chemistry and physics at Tabor College, Iowa, and in 1895 graduated from Goettingen College, Goettingen, Germany, where he received his M.A. and Ph.D. degrees. He then became a research chemist for Stone & Webster. In 1922 he resigned to accept a position as research chemist for the Blackstone Valley Gas and Electric Company of Pawtucket, Rhode Island.

The death of Dr. Mighill is a serious loss to the gas industry. He devoted practically his entire life to chemical research in the manufactured gas industry, and his many contributions to the industry will long be remembered. During his many years as a member of the American Gas Association he served on many committees, the most recent of which was the committee for the revision of the Gas Chemist's Handbook.

From 1922 until his death he was on the staff of the Blackstone Valley Gas and Electric Company as research chemist, but often served as a consultant to other companies in the industry when they were confronted with problems in the manufacture and distribution of gas.

He leaves his widow, Mrs. Louise Foster Mighill, and a daughter, Marjorie Foster Mighill of Newtonville, Mass.

CLARENCE P. LEGGETT

CLARENCE P. LEGGETT, grandson of Samuel Leggett, president of the first gas company in New York, died in September. He was 90 years of age, having retired from American Agricultural Chemical Co. of New York 15 years ago.

His grandfather's home at 7 Cherry St., New York, was the first in Manhattan to be lighted with gas when such installations were made in 1823.

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* A tribute to Dr. Mighill appears on page 427.

A Better Gas Stove Because of Bombs

AN engineer of the American Stove Company, peacetime manufacturer of gas ranges, now making 500-lb. bombs and other presents for the Axis, when asked how experience gained in war production would be helpful in building stoves after the war replied as follows:

> We have learned the value of continuous production line, where we have a standard product of the same design and same operation going through that line continuously, hour after hour, day after day.
>
> We have learned that we can set up an item made that way in very small space.
>
> We have learned to make tools and use tooling processes which we have never tried in the past and which we will probably try on tooling stoves and manufacturing processes in the future.
>
> We have learned to work to much greater accuracy than in the stove business and will probably work to much closer dimensions on our stove production in the future and will get a much better product as a result.

We have learned to improvise and have learned the value of organization, teamwork and planning.

"Panhandle Lines" Makes Debut

AN attractive, eight-page publication, "Panhandle Lines," published by Panhandle Eastern Pipe Line Company, made its debut with the August issue. Printed in two colors, its make-up shows discriminating taste and its content is both interesting and informative. The front cover carries a message from Panhandle Eastern's board chairman, William G. Maguire, and the back cover presents the company's Honor Roll. In between are stories of the company's reorganization, pension plan, new construction, and such feature items as "We, the P.E.P.L." and "Looking Ahead."

Gas on the European Continent

(*The Gas World*, London, August 14, 1943)

A 10 PER CENT cut in gas consumption has been decreed in Berlin. Up to now both gas and electricity users have only been cajoled into saving. Restrictions are local, and it has been up to the authorities to find ways of enforcing them. This is the first time, however, that Berlin has had a compulsory cut although many other towns have been placed under restrictions for a long time. Side by side with this, the Commissioner for the Four-Year Plan has announced a national cut in electricity and gas consumption.

R.A.F. bombing does not appear to have done the Essen gas system very much good. Recently, the Mayor explained that in spite of cutting supplies off to damaged houses, it was still impossible to bring pressure up to normal because of the numbers of leakages. He has, therefore, asked all householders to notify the authorities the moment they find a leak. A premium of three RMarks will be paid for serious damage and 10 RMarks if the damage is reported quickly.

The General Government of Poland has decreed that private and other cars are to be adjusted for the use of natural gas.

If We Had Only Known or, Please Send Him Again

SEARCHING through the files the other day, a document of more or less historical importance came to light. It was a communication from T. Sumita, managing director of the Kyoto Gas Co., Kyoto, Japan, dated July 15, 1927, addressed to the American Gas Association. It reads:

> "Blessing the prosperous progress of your Association to which I belong with gladness as a member, I beg to inform you that I am going to send to your United States Mr. Minoru Wada, engineer of our Gas Works in order to inspect American Gas Works and Business, and he will leave Japan on 17th prox. with my introduction letter. When he visits your Bureau after his arrival, please dispose of him as you may think best."

So help us, it's authentic! Our librarian says it comes from our "Well I'll Be Damned" file.

Gas Employee Rescues Man in Army

A REMARKABLE experience of an employee of The Brooklyn Union Gas Company, now in the service, proves the value of gas industry training. Private Louis Bader writes to his company from Fort Jackson, S. C.:

> "I am with a QM outfit. I might say I accomplished something due to knowledge acquired in the coke oven plant. We were out on a raft in the lake when a man went down. We found that the body had settled in the mud at the bottom. When they finally hauled him out I applied prone pressure for about 30 minutes and finally got him breathing. He was taken to the hospital where I am pretty sure he recovered.
>
> "The lieutenant in charge of the ambulance commended us for our good work."

Woods Appointed

CHARLES F. WOODS has been appointed service and installation manager of the Dallas, Texas, branch of Minneapolis-Honeywell Regulator Company.

Mr. Woods recently served with the post engineer, Camp Swift, Texas, and was formerly associated with the Southern Union Gas System as local manager at Brenham, Texas.

Personal AND OTHERWISE

Pollard to Leave Seattle Gas Co.

James F. Pollard

THE resignation of James F. Pollard as president of the Seattle Gas Company was announced last month. Also announced were a number of major changes in the executive organization of the company. Mr. Pollard is leaving Seattle because of advice of physicians that a return to California is necessary for the benefit of Mrs. Pollard's health.

Winner of the Charles A. Munroe Award in 1939 for his leadership in starting the gas industry's national advertising campaign, Mr. Pollard is widely recognized for his many contributions to the industry. He became general manager of the Seattle company, January 1, 1930 and was elected president in 1936.

N. Henry Gellert

N. Henry Gellert has been selected to succeed to the presidency. In order to do this, Mr. Gellert is resigning as president of the Great Lakes Utilities Co., Atlantic Gas Corp., Pennsylvania and Southern Gas Co., and of all subsidiaries of these. He will continue as president of American States Utilities Corp. and Southern California Water Co. and as chairman of the board of Edison Sault Electric Company. Mr. Gellert will make his home in Seattle after November 1, 1943.

Charles M. Sturkey is to be vice-president and general manager of Seattle Gas Company and has resigned as president of Ohio Gas Light and Coke Co. and as vice-president of Great Lakes Utilities Co., Atlantic Gas Corp. and Pennsylvania and Southern Gas Co., and as officer and director of all of their subsidiaries. He is moving from Rock Hill, South Carolina to Seattle immediately.

Norbert O. Fratt, who started with the company in 1928 as a salesman and has for several years been domestic sales manager and recently assistant general manager, is now advanced to vice-president in charge of sales and merchandising.

P. R. Dunbar, who has for the past twelve years been auditor and chief accountant, is advanced to the office of comptroller.

John F. Shaw, who has served the company in various capacities for the past ten years, is now advanced from the position of engineer of maintenance and construction at the gas works to chief engineer.

Yellott Appointed Gas Institute Director

John I. Yellott

JOHN I. YELLOTT, recipient of Chicago and Illinois Junior Chamber of Commerce awards for distinguished service in 1942 for his educational training activities, has been appointed full-time director of the Institute of Gas Technology at Illinois Institute of Technology, it was announced Sept. 21 by Dr. Henry T. Heald, president.

Mr. Yellott, who has been chairman of the department of mechanical engineering and director of war training at Illinois Tech, assumed the duties of his new position as of Sept. 1. He succeeds Harold Vagtborg as director of the Gas Institute.

Mr. Vagtborg, director of the Armour Research Foundation at Illinois Tech, served as director of the Institute of Gas Technology during its first two years of operation in addition to his duties as director of the Foundation. At the inception of the Gas Institute in 1941, Mr. Vagtborg agreed to assume the directorship for a maximum of two years to assist in getting its program underway. He will henceforth devote all his time to his duties as director of the Armour Research Foundation whose industrial research program demands his undivided attention.

In becoming full-time director of the Gas Institute, Mr. Yellott will also assume the duties of directing the educational program. Dr. Lincoln R. Thiesmeyer, who formerly served as educational director of the Gas Institute, resigned effective Sept. 1 to enter government service.

Mr. Yellott has been chairman of Illinois Tech's mechanical engineering department for the past three years and became director of the war training program in its first year in 1941. An honor graduate in mechanical engineering of Johns Hopkins University, he was formerly chairman of mechanical engineering at Stevens Institute of Technology and a member of the mechanical engineering faculty at the University of Rochester. He has also served as an industrial consultant in power and steam flow.

In 1939 Yellott was named as the outstanding mechanical engineer of the past decade by Pi Tau Sigma, honorary mechanical engineering fraternity.

Veteran Gas Executive To Retire Jan. 1

Walter F. Norton

WALTER F. NORTON, district manager in Nashua, N. H., of the Public Service Co. of New Hampshire, who has served in the gas industry for 53 years, will retire next January 1, according to an announcement by Avery R. Schiller, president and general manager. He will continue in an advisory capacity in the company. He will be succeeded by Merton T. Carter, manager of the Keene district.

One of the best-known utility men in New England, Mr. Norton has an enviable record of public service. He has been engaged in the gas and electric business in Nashua since graduation from high school in 1890. He entered the employ of the Nashua Light, Heat and Power Co. that year and in 1897 was named manager of the gas department. In 1926 he became district manager of the present company.

In addition to being a member of the American Gas Association, Mr. Norton is a past-president of the New England Gas Association and treasurer of the Guild of Gas Managers. He has held the latter office for 29 consecutive years.

Patton Joins PAW

APPOINTMENT of Mark S. Patton, of Tulsa, Okla., as director of natural gas and natural gasoline for the Petroleum Administration for War in the Midwestern States (District II) was announced Sept. 17 by Petroleum Administrator for War Harold L. Ickes.

Mr. Patton succeeds Seth W. Herndon, who resigned, after serving in that capacity for a year, to return to the Herndon Drilling Co., of Tulsa.

Servel Executive Personnel Changes

Harry Newcomb

FIVE major changes in the administrative organization of Servel, Inc. were announced Sept. 1 by Louis Ruthenburg, president. The changes are as follows: Harry Newcomb, formerly vice-president in charge of the company's electric refrigeration and gas water heater divisions, becomes vice-president and assistant to the president.

North I. Townsend, formerly secretary and treasurer, becomes vice-president in charge of finance.

North I. Townsend

Rudolph Schnakenburg, formerly comptroller, becomes secretary and treasurer.

W. F. Hassee, formerly chief accountant, becomes comptroller.

Henry O. Roberts, personnel director, assumes responsibility for the personnel administration of all the divisions of the company, reporting to the president.

Servel's other vice-presidents will continue to act in the same capacities as they have in the past. They are:

George S. Jones, Jr., vice-president in charge of sales; W. R. Hainsworth, vice-president in charge of engineering; W. E. Baker, vice-president in charge of manufacturing; and Harry A. Strong.

This announcement comes as a part of Servel's program in preparing its organization for rapid post-war development of many diversified products for the American home. In addition to the Servel gas refrigerator, a complete new line of gas water heaters and commercial electric refrigeration products, Servel also has other new appliances such as air conditioning units scheduled for early post-war production.

Payne Heads Pacific Coast Gas Group

E. L. Payne

E. L. PAYNE, E. Payne Furnace and Supply Co., Beverly Hills, was elected president of the Pacific Coast Gas Association at that organization's Golden Anniversary meeting at the Ambassador Hotel, Los Angeles, Sept. 22-23, O. R. Doerr, Pacific Gas and Electric Co., San Francisco, was named vice-president and D. G. Martin, Pacific Gas and Electric Co., San Francisco, was chosen treasurer.

O. R. Doerr

War and post-war problems of the Pacific Coast gas industry were reviewed at the meeting which was highly successful. A special dinner program directed by Al. C. Joy, Pacific Gas & Electric Co., was held to commemorate the Association's 50 years of constructive work in the gas industry.

New directors elected at the meeting are: F. F. Doyle, Pacific Gas and Electric Co., San Francisco; W. J. McCoy, Southern Counties Gas Co., Los Angeles; D. H. Perkins, San Diego Gas and Electric Co., San Diego, and A. H. Sutton, Mission Water Heater Co., Los Angeles. Mr. Sutton was also elected general chairman of the Manufacturers' Section.

Allen Leaves PAW

ROBERT E. ALLEN has resigned as assistant deputy petroleum administrator for war, Harold L. Ickes, PAW director, announced Sept. 15. Mr. Allen is leaving PAW to become director of the Department of Information of the American Petroleum Institute in New York.

Mr. Allen joined the staff of the then Office of Petroleum Coordinator for National Defense as director of production on June 16, 1941, as the first director appointed by Petroleum Coordinator Ickes.

Hollingsworth Gets New Post

JOHN M. HOLLINGSWORTH has been appointed manager of the newly organized sales promotion department of the Iowa-Illinois Gas and Electric Company whose headquarters are in Rock Island, Illinois. Announcement was made recently by John V. McKinney, president of the company.

A member of the United Light and Power Service Company organization in the capacity of advertising manager since 1929, Mr. Hollingsworth will have charge of all sales promotion and advertising activities of the Iowa-Illinois Gas and Electric Company group.

His office will remain in Davenport, Iowa.

Setchell Reports for Naval Duty

Ensign Setchell

J. STANFORD SETCHELL, assistant utilization engineer of the American Gas Association, who recently received his commission as Ensign in the United States Naval Reserve, was called to active duty on Sept. 28. He has been assigned to the Bureau of Ordnance, Volunteer Reserve, Special Service, and will receive his indoctrination training at Fort Schuyler, New York.

Ensign Setchell's engineering experience in the gas industry includes work on the property records inventory of The Brooklyn Union Gas Co., followed by seven years in the utilization department of the American Gas Association. He is a graduate of Polytechnic Institute of Brooklyn where he has been an evening instructor for seven years.

He has had 11 years' boating experience including the past three as a member of the Coast Guard Auxiliary.

CONVENTION CALENDAR

OCTOBER

Oct. 5-7 **National Safety Congress**
Hotel Sherman, Chicago, Ill.

19 **Industrial Gas Round Table National Metal Congress**
Chicago, Ill.

26-28 **American Gas Association, Annual Meeting**
Jefferson Hotel, St. Louis, Mo.

NOVEMBER

Nov. 19 **Mid-Southeastern Gas Association**
Sir Walter Raleigh Hotel, Raleigh, N. C.

DECEMBER

Dec. 3 **American Society of Mechanical Engineers**
New York, N. Y.

6-10 **National Association of Manufacturers**
Waldorf Astoria Hotel, New York, N. Y.

Accounting SECTION

L. A. Mayo, *Chairman*
O. H. Ritenour, *Vice-Chairman*
O. W. Brewer, *Secretary*

The Accountant Looks at Post-War Problems

By E. N. Keller

Manager, Customers' Accounts Division, Philadelphia Electric Company

E. N. Keller

IT has been said that "a prophet is without honor in his own country." Surely, a utility accountant who attempts to predict what the future may hold can be said to be without honor in his own industry. Therefore, gentlemen, I can assure you there is "no freedom from fear" in my approach when I come before you and dare to attack that bogey of 1943—"post-war planning."

Talking of post-war planning is like paying a visit to the studio of a famous artist. The finished paintings are familiar to you; you can appreciate the time and energy that has been put into them. The unfinished painting, however, is the one which catches your eye and even though a faint outline is apparent, you know there will be many alterations, many perspectives penciled in and penciled out before the real one takes on a permanent line. What we have done in the past and are doing now is a finished picture to us, but the unfinished canvas of the future is what concerns us now. Just how much and what are we going to sketch in now? The shape of things to come is a fascinating subject to ponder on, but we cannot afford to rush ahead and attempt to outline a complete painting until we are sure that our basic lines are correct.

To Plan or Drift?

It has been said with respect to post-war political and economic planning that no decision can be made with finality because nobody knows what conditions will be at the end of the conflict. Preparations can be made only for some of the possible conditions, with a general direction definitely in mind. If such post-war planning can be no more definite than a general direction, it is apparent that an industrial concern is in a far less favorable position to accomplish any more conclusive planning. In political matters, governments very often by decree or law can make their plans materialize. An industrial concern, and more particularly a utility, by reason of regulatory restrictions, in many instances has no voice in consummating its desired plans.

Should we, therefore, under such conditions sit back and let Fate take its course? A utility man never admits defeat and despite adverse conditions will insist on getting his plans projected, perhaps in many directions.

To go to work on such a problem with particular reference to those functions centered around customer activities, requires first some thought as to just how radically and in what fields changes have so far been made.

In the matter of collections, insofar as I know, there has been little change except of a mild character and this has been confined to reducing the number of collection calls and classifying customers more intensively than before—all a bulwark against the loss of manpower and the necessity for reducing car mileage.

War's Effect on Customer Relations

With respect to customer relations, this function, too, has undergone curtailment in the matter of trips for the execution of orders for turning on or off service, making adjustments to appliances and like matters—again brought about by decreased manpower, less gasoline and fewer tires. In this particular field some thought has been given by various companies to the possibility of not turning off service when a customer moves, so that it will be immediately available when the new customer moves in. Thus, the curtailment of effort with respect to turn on, while reflecting some difficulties in the matter of bill adjustments, at least doesn't adversely affect the customer to any appreciable extent. There has been some effort made to answer high bill complaints more often by telephone or letter than by visits to the customers' premises. Such developments, however, have been spotty and not very widespread on any particular recognized plan.

The most radical developments have been in the meter reading and billing functions. Practically all of these have been centered around a lengthening of the period between readings with or without an interim bill of the estimated variety, of one kind or other. These plans have undoubtedly accomplished a great amount of saving, not only in dollars and cents but in manpower and the use of cars—the two factors which started the ball rolling.

It must be remembered that inasmuch as these developments sprang from necessity and the labor situation, it is not safe to conclude that when the necessity passes they can be maintained. It is true that customer acceptance during this period of stress has been remarkably good, but again there is no assurance that when the crisis is over customers will not more minutely examine the short cut plans and criticize them severely. It is a strange thing but in times of depression a customer's eyesight apparently becomes very keen and he grows analytical in direct ratio to the shrinkage of his bank balance!

Another factor with respect to the billing function is the question of the equipment available to do the job. Some companies found themselves in the position of being unable to absorb even natural growth on the equipment in use and, with the unprecedented increase in customers in defense localities, were under pressure to do something which would relieve the wear and tear on existing equipment because it could not be replaced. The lengthening of the billing period where no interim bill is rendered, or an interim bill of certain types, has accomplished the relief of this equipment problem. No one knows how long this emergency period will last and, certainly, any company that is foresighted has taken measures to see that their equipment will last just as long as possible through some short-cut method.

Commission Regulations

To help along the plans concerning meter reading and billing many State Commissions by reason of numerous applications from utility companies under their jurisdiction took it upon themselves to issue regulations allowing certain privileges. Some put a time limit on these regulations which is an indication that they do not intend to put a permanent stamp of approval on such innovations. This is cited simply as an illustration that the short-cut reading and billing plans are, in effect, on probation. Therefore, it seems to me that this is a problem for us utility accountants to make these plans work so well that, when the time approaches for continuing such operations after the war period, we will have demonstrated that they are just as applicable to peace time as to the stress of war. This, of course, depends on the particular utility's desires in such matters. It may readily be that because of limitations on the ability to follow up estimated bills to the point of

Presented at Joint A. G. A.-E. E. I. Accounting Conference, Cincinnati, Ohio, April 27-28, 1943.

shut off, when economic conditions change for the worse, utility companies may not want to continue the lengthened billing period.

Of course, there is also the factor that the manpower situation may become such that unemployment problems may make it desirable, in the interest of good public relations in the territory served, to see that employment is made available for as many of the men returning from military service as is possible. This may, in turn, cause a resumption of monthly reading and billing processes. Then, too, there is always the chance that many of the boys who will return from service will not want to go back to the kind of work they were doing before the war. After having played an active role in such a dramatic conflict, their pre-war jobs may seem prosaic and they may prefer to continue in the line for which Uncle Sam has given them some training. Undoubtedly, there will be a number of new fields opening up for additional activities such as airplane construction, communications, etc., and some of the service men will naturally gravitate toward them. If this happens to any great degree and there is no unemployment problem otherwise, then the return to monthly reading will become unnecessary from that viewpoint.

United Front Desirable

Notwithstanding all these uncertain factors, it does seem as though we will "miss the bus" entirely if we don't attempt to consider seriously some plan or trend for the future. The great difficulty is that despite the fact that many of the utility companies, and particularly the larger ones, have resorted to the lengthened meter reading and billing periods, there is a great diversity of opinion as to what to do with the intermediate periods. The industry, as a whole, would be in a much better position to continue such plans if it were able to agree about some of these details and present a more united front, within a particular state at least.

Much more could be accomplished by more frequent meetings of those interested in such matters, preferably within the frame work of the two service associations; for, even if nothing should come out of it beyond keeping up to date on developments in the meter reading field, billing plans or other matters within the jurisdiction of the customer groups—then the time would be well spent.

There are likely to be some quite radical mechanical developments after the war. Undoubtedly, many of the things which have been invented or improved or adapted to military uses, and of which perhaps we know too little, will find their way into application to such things as billing—making the job more mechanical than ever. Even meter reading might not be immune from mechanization, to some extent. Something has been said to the effect that the "walkie-talkie" could be adapted to such a function by having the meter reader equipped with this apparatus. He could relay the reading back to a central point from the customer's house. The reading would then be recorded and a card mechanically punched immediately for the purpose of billing. This may sound fantastic but with the marvelous strides being made today in the scientific field, certainly it is not beyond the realms of possibility.

This matter of greater mechanization is one of the important factors for consideration in post-war planning. We can't expect the office machinery manufacturing companies to do a good job for us unless we can give them a preview of our expected needs.

One of the problems that nobody seems to have been able to solve is the great volume of routine work in the customer activities group, centered around the meter reading, billing and accounting functions. To the layman at least, it seems like a terrible loss of effort to have somebody continually going the rounds reading meters, making out bills, receiving cash, sorting cash stubs and posting the records. It is a day-in and day-out job. The only approach to reducing this has been the innovations mentioned before, starting with the lengthening of the reading periods. If something could be developed to reduce the inside work on the accounting end of the procedure it would be well worth while. It now looks as though it might be one of those unanswerable questions; but some day someone will devise a method as radical and far-reaching as the change from ledgers to stubs twenty years ago.

I know that we all have so many problems today brought about by the constantly changing regulations regarding manpower that, at first, we may think there is no time to do anything except live and plan from day to day. Efforts toward long range planning appear to be a burden but on reflection I think you will agree that, despite the sacrifices which may have to be met to do it, it will pay dividends.

In the meantime, my suggestion is that the Chairman of the two groups in the A. G. A. and E. E. I. concerned with customer activities make it a point to form the nucleus of a group which will have as its purpose the development of systems already in use and some crystal gazing in an effort to determine just where we are headed. Remember, ideas are not rationed. Good healthy discussions produce good results.

Don't forget that we have never yet faced a problem in the customer accounting field of the utility business that we have not been able to solve. It has been aptly said "The present is the time in which we act; the future that for which we prepare." So, let's get out our mental paint brushes and at least make an outline of the post-war picture! Then, I am sure that whatever the future may hold in store for us, it will not be said that our planning was "too little and too late."

Accounting Course Opens at N. Y. U.

A NEW course in public utility accounting opened in September at the New York University Graduate School of Business Administration. Taught by Dr. Bernard S. Rodey, associate controller, Consolidated Edison Co. of New York, Inc., and past chairman of the E. E. I. Accounting Section, the course is designed to give a practical working knowledge of accounting in the utility field. It will be valuable to advanced students of public utility economics and to the utility accountant seeking a broader knowledge in his field.

GAS SUMMER AIR CONDITIONING

(Continued from page 393)

equipment or further study to work out the developments required.

5. As a result of this investigation the Laboratories through their present facilities, trained personnel, and contact with field conditions (through the Joint Committee on Summer Air Conditioning) are now in possession of considerable technical information on gas summer air conditioning equipment which is available to the industry.

While much of the mystery surrounding air conditioning processes in which gas heat may be used has been removed there is still opportunity for new processes, new developments and greater perfection of present equipment. Research and development of this new industry should continue at an accelerated scale. Even greater scientific efforts and more financial backing are needed to speed the attainment of general use of gas summer air conditioning. While the list of things research men would like to do, and without doubt could do with proper support, is too long to even mention here, the following five items of major importance may be mentioned:

Basic design and construction details of duct systems for residences
Water softening materials and devices for cooling tower and boiler
A refrigerant-solvent combination capable of general application
Methods and equipment for control of humidity independent of sensible heat
Conservation of cooling water

However, these and other research items are primarily stepping stones to greater accomplishments. Their solutions need not delay maximum distribution of present day equipment when conditions permit.

Residential SECTION

B. A. SEIPLE, *Chairman*
C. V. SORENSON, *Vice-Chairman*
J. W. WEST, JR., *Secretary*

Post-War Gas Appliance Survey Under Way

F. M. Rosenkrans

THE Post-War Planning Committee of the American Gas Association is conducting a nation-wide survey designed to secure a cross-section of gas industry opinion on improvements in present gas appliances and new developments and appliances needed for the post-war period. To accomplish this purpose a survey form or questionnaire is being mailed to all gas companies to secure their views on this vital subject.

This survey form has been most carefully prepared by the interested appliance committees of the Residential Section working with the special Post-War Planning Subcommittee under the chairmanship of F. M. Rosenkrans of Kansas City, Mo.

It has been prepared in such a way as to make it possible to collect, collate and evaluate company opinions to provide a picture of the nature and extent of the industry's needs from national, regional or state viewpoints as well as from the viewpoints of the natural, mixed and manufactured gas companies.

To Evaluate Improvements Needed

The Post-War Planning Committee aims to determine the most-needed improvements and developments in the residential fields of ranges, refrigerators, water heaters, house heating, and air-conditioning. So that definite findings may be made on the relative importance of these matters to the industry, a number of possible improvements has been listed for each appliance with the request that each company indicate the relative importance it attaches to each. Such suggestions are not intended to be limiting, and companies are also requested to list and rank any other appliance improvements which may be important to them. To enable these needs and recommendations to be interpreted in terms of potential sales, data is requested on sales of the appliances in each field during the calendar year 1941.

As a rule, radically new developments and improvements in any equipment represent additional costs which are reflected in the sales price, at least during the initial period of their introduction. One of the best ways of bringing about a reduction in the first cost of appliances is to increase the volume of each unit produced by reducing the number and types of models of gas appliances to the minimum necessary to meet the market demand. To this end, the survey form requests the advice of each company as to the minimum number of types and models of gas appliances adequate to meet the needs in its territory. The Post-War Planning Committee urges that the response to these questions be most carefully prepared in the belief that a great deal can be accomplished in this manner to reduce the first cost of gas appliances in the future.

Summaries of the responses, analyzed from several viewpoints, will be sent to all gas appliance manufacturers and gas companies responding. In evaluating the recommendations received, similar surveys conducted by several state and regional gas associations and manufacturers will also be considered.

This survey, the first of its kind, will undoubtedly settle questions of vital interest to every gas company and every gas appliance manufacturer and will expedite the maximum use of the industry's resources for appliance research and development to meet post-war competition.

Kitchen Laboratory at Montana College Sets Pattern for Homemakers

By JESSIE MCQUEEN, *Home Service Counsellor, American Gas Association*

THE necessity of good equipment and efficient working arrangements in the home economics classrooms of our schools is obvious, for it is here that the standard for future homes and the work patterns of future homemakers are developed. Since the ideal of such a working laboratory is to approximate home conditions, unit kitchens provide the most desirable plan of arrangement.

At Montana State College, Bozeman, Montana, the home economics department, headed by Dr. Gladys Branegan, dean of women, has a most interesting kitchen laboratory which, because of the many ideas for kitchen arrangements, materials and equipment, has constituted an important demonstration in itself, as well as serving as a workable laboratory. The planning of space and equipment was done over a two-year period by senior home management classes, and the plans included drawings for wooden cabinets, all of which were made in the college work shops.

Two ideas were basic in the planning of this laboratory. One was to provide as much variety as possible in arrangements, in types of both large and small equipment, and in materials used. The other aim was to develop a laboratory which could be used for different purposes—classes in meal serving, experimental cookery, household equipment, home management, for demonstrations, and for individual or group student-experience.

PLAN ARRANGEMENT FOR 5 UNITS

Equipment

Ranges—gas, electric and self-stoking coal.
Refrigerators—gas and electric.
Sinks—Double and single case with drains and backs attached, double and single installed in table tops with metal flange.

Table Tops

Working heights—vary in steps of one inch from 33 inches to 38 inches.
Top materials include wood, monel, glazed and unglazed tile, masonite, plain and mottled linoleum, formica and enamel.

Storage

Flour and sugar—different placements in drawers, containers and bins.
Dish Storage—corner cupboard, cupboard at end of work table, tall cupboards with racks on door and shelves closed by table dropped for use at meal time.
Utensils—drawers, perpendicular drawers with hooks, tall cupboard with hooks.
Pans and lids—racks on cupboard doors, filing compartments in upper shelf on cupboard and filing compartments in drawer.

Below—Kitchen laboratory at Montana State College with gas range and meter showing at right. Here and in other kitchen units the students learn much about food preparation, kitchen arrangements and equipment

One of five dining units attached to the kitchen laboratory. This table shelf folds up to the wall; seats also fold into the wall. A corner of the gas refrigerator may be seen at right

The largest kitchen in the laboratory has unusual features. The outside of the cabinet is made into a snack bar. On the inside is a desk unit with the working shelf hinged in the middle for utilitarian purposes

Cutlery—in wooden rack in open, rack in drawer and partitioned drawer.

Towel racks are rods in bottom of drawers, sliding board with pegs, extension rods and a rack in perpendicular drawer.

Garbage containers are provided on door, floor and digestor attachment on sink drain.

Meal Service Arrangements—varied in each unit

Large shelf, hinged to wall which lifts up for meal service and when lowered is a flat panel against the wall.

Large cupboard panel which drops down when needed and serves as a door to the dish cupboard when it is up.

Portable drop leaf table.

Refractory enamel top table.

Snack bar with chairs which look like bins and can be pulled out.

Utensils

Utensils in each kitchen adhere as closely as possible to one type of material, with pyrex, aluminum, enamel, copper, brass and stainless steel each the basic material in one unit.

Meters

Special gas and electric meters are installed to record the consumption which makes it possible to conduct studies of comparative costs.

The largest kitchen, No. 5, contains several special features. It has laundry equipment, including an automatic washer and a power ironer; two stoves, and one cabinet arranged for demonstration purposes which also includes a small stove and a round sink and dishwasher. The outside of the cabinet is made into the Snack Bar. On the inside is a desk unit with the working shelf hinged in the middle, the inner portion pushes back into the cabinet while the outer portion folds up and constitutes the door to the desk.

Throughout the nation, colleges in home economics are centering even greater activity on kitchen planning courses. To have laboratories for test purposes which provide many opportunities for study is the aim of every college director. Since home service directors in gas companies are graduates in home economics, it is of value to know that they are coming from schools where equipment study is being given more consideration, along with new equipment to use.

To assist in suggestions for laboratory arrangements, the Home Service Committee, as far back as 1937, set up a booklet entitled "Modern Kitchens for Homemaking Instruction." This booklet describes the arrangement and equipment convenient for the teaching of foods work in home economics—and, of course, gas equipment is featured. This book has been given wide distribution by gas companies to their school and college instructors in communities and has been commended not only for the outline of subject matter, but particularly for the inclusion of many photographs of actual school arrangements in various parts of the country.

Home Service Director Now in Pacific Area

IN a V-letter written July 30 from somewhere in the far-away South Pacific, Rita Richards, former home service director in the Ventura District, Southern Counties Gas Co., California, tells of her very interesting life as a dietician in the Army. She mentions moving from her temporary quarters in a tent to a swanky building with cement floors, a roof, windows, actual showers and other "modern" conveniences.

Incidentally, she modestly mentioned that she had been made head dietician of her unit and advanced to a first lieutenancy. She reports that she is cooking on a regular army type stove with liquified gas. She has enjoyed some thrilling sightseeing trips around the nearly tropical isles with an excellent pilot and on land tours in a tiny French car.

It is evident that she is not on Kiska because she speaks of picking oranges, lemons, tangerines, bananas and cocoanuts. She always takes her G.I. pants and shoes along to avoid being bitten by mosquitoes. "It is either the mosquitoes or the mud and rain," she states.

She uses a Servel refrigerator and sees many of them on duty although she stated that all insignia had been removed "no doubt to be used for trading with the natives."

—*Southern Counties Gas News.*

Boston Canteen

ACTING as collecting agency for cookies for the Boston Stage Door Canteen is another war service performed by the home service department of the Boston Consolidated Gas Company, Susan Mack, director. Like its sister canteens in other cities, the Boston unit offers free entertainment, pretty girls to talk to and dance with, and light refreshments to all service men.

Post-War Industrial Gas in Britain

A CORRESPONDENT in *The Gas Times* (London) makes the following observations regarding industrial gas after the war. While many of his thoughts correspond with those of industrial gas men in the United States and Canada, all industrial gas men will benefit by reading them carefully.

"The industrial sphere requires to be combed consistently to ensure that no potential development will be overlooked. This applies to works of all types and sizes, and will necessitate steady and persistent application. In every supply area a complete survey should be made of all commercial and industrial consumers, in alphabetical, area or trade tabulation. This register should not only be a record of all existing gas-consuming equipment but should contain information in respect to all other existing or potential fuel applications on consumer's premises. Non-consumers should be listed, and once the register has been completed it is a simple matter to keep it up to date. This is a matter which should be attended to now, as it is the only real basis upon which the proper development of an area can be formulated.

Small Consumers Important

"At the present time, loads of large size are easily won, and this must inevitably lead to a certain mental apathy towards the cultivation of innumerable small loads, but in the transition period which is to be expected, the small consumers may well be the backbone of our business. They are high-priced gas consumers in an adjacent category to that of the domestic consumers.

"Other aspects to be considered are advertising, propagation of information on industrial gas applications (both existing and developing), and a constant watch for new trade processes which may materialize in the efforts to build up new industrial markets.

"Advertising of industrial gas applications is difficult owing to their variety, and the limited 'interest' scope of any particular subject. Technical papers—prose and verbal—should concentrate on technical data and not be used as advertising 'puffs' for local undertakings. Lantern slides of an informative nature can be helpful, but short films of the right type would be more to the point, and should replace the 'still life' studies of gas equipment common to most exhibitions. The steady dissemination of technical periodicals has maintained a certain amount of interest amongst consumers, and some good business has emanated from this source but it should be expanded by the circulation of furnace maker's literature indicative of modern designs and trends, and excerpts from other technical sources, English or foreign.

Bigger Selling "Overheads" Necessary

"There should also be a greater readiness to send representatives to cull requisite information on site, whether it be at home or abroad. It should be realized that we must envisage certain expenditure to encourage new business, and this will be required for advertising, publicity and experimental work. It is pertinent, that by some curious mental process, most undertakings are prepared to spend large sums of money on domestic advertising and exhibitions, but grudge even a few shillings to assist their industrial activities, although the loss of any business, however small, is treated as a heinous crime—a case of being expected to make bricks without straw.

"Another vital necessity is the extension of service to industrial consumers. Where such service exists it has proved to be of great value, and has assisted the building up of both good business and goodwill amongst consumers. The maintenance of plant at high efficiency has been a boon in wartime, and should be continued, as it will be necessary to minimize time now taken in the supervision of construction and repair work, in order to concentrate on development. The cultivation of a central heating load, for example, will automatically create a demand for greater service, and it will be money well spent."

Help for Gas Food Service Dealers

AHRENS Publishing Company, publishers of *Restaurant Management,* announces the appointment of a Food Service Equipment Dealer Advisory Board composed of leading dealers in all parts of the country. They will check all material for technical accuracy, etc., before publication, and will help in other ways to assure that restaurant operators will attain the utmost efficiency in their operations.

The Food Service Equipment Dealer Advisory Board has adopted the insignia shown.

Members are:

I. S. Anoff, Albert Pick Co., Inc., Chicago, Ill.; M. Blickman, S. Blickman, Inc., Weehawken, N. J.; W. L. Carey, The Stearnes Company, Chicago, Ill.; S. J. Carson, Carson Crockery Company, Denver, Colo.; W. F. Dougherty, W. F. Dougherty & Sons Co. Inc., Philadelphia, Pa.; G. O. Dove, Jr., E. B. Adams Co., Washington, D. C.; M. P. Duke, Duke Manufacturing Co., St. Louis, Mo.; A. W. Forbriger, The John Van Range Company, Cincinnati, Ohio; A. Muckler, Jr., Southern Equipment Co., St. Louis, Mo.; H. Ruslander, Ruslander & Sons, Inc., Buffalo, N. Y.; H. F. Sanderson, J. A. Brucken Co., Inc., Evansville, Ind.; C. F. J. Schied, Bramhall Deane Company, New York, N. Y.; C. Scruggs, Scruggs Equipment Company, Knoxville, Tenn.; S. R. Sperans, Nathan Straus-Duparquet, Inc., New York, N. Y.; J. F. Sullivan, Dohrmann Commercial Company, San Francisco, Calif.; M. Thompson, Thompson-Winchester Co., Inc., Boston, Mass.

Gas Round Table at Metal Congress

THE Industrial Gas Round Table at the National Metal Congress will be held in Private Dining Room No. 18 of the Palmer House, Chicago, Wednesday, October 20, at 9:30 A. M. The round table will be sponsored by the Industrial and Commercial Gas Section of the American Gas Association and will be presided over by Carl H. Lekberg, Public Service Company of Northern Indian, Hammond, Indiana. There will be a full program reviewing the technical experiences in applying gas to various metal-treating operations under war production conditions and several authorities will speak on plans for industrial gas utilization during the post-war period.

All gas men, manufacturers of equipment and others interested in modern heat-treating methods and appliances are invited to attend.

Gas Furnace Durability

LINDBERG Engineering Company of Chicago, manufacturer of industrial gas furnaces, for several months has been featuring in two-color full-page ads, a 6-year old Lindberg "cyclone" gas tempering furnace with an unusually low maintenance cost.

This furnace, which is on steady war production work, is only 22 inches inside diameter by 26 inches deep. But it turns out 29½ tons of tempered parts per week. The fine job this furnace is doing is indicated by the fact that maintenance costs have averaged only one penny for each ton of parts heat-treated!

Sturdy fellows these gas furnaces on the war production line.

Home Town News for the Boys Overseas

A NUMBER of industrial and commercial departments of gas companies and equipment manufacturers are sending news letters to their men in the armed forces. One of the snappiest is published by the industrial department of the Washington Gas Light Company, Washington, D. C., under the somewhat appropriate title "Hot Air Flashes" and with the secondary slogan "All the News Whether It's Fit to Print or Not." This is a six-page sheet that reflects the personality of the assistant manager of the department, Thomas M. Offutt, but also lets the boys know how the business is getting along.

Everybody in the department takes a crack at getting out "Hot Air Flashes" and each person's material has a punch heading. For instance in the last issue some of the headings were "Offutt's Orations"; "Hayes' Hallucinations"; "McHorney's Mush"; "Nyes Nubbins"; "Bits from the Boss—L. Oursoff"; "Millie's Mutterings" and "Pat's Patter." The breezy sheet ends with a big LOVE AND KISSES—From the Friends You Left Behind.

Knowing some of those who left that department to go into the services we are sure they get a big kick out of receiving "Hot Air Flashes." Incidentally the industrial department is leading all other departments in Bond Buying.

KAISER MAGNESIUM PLANTS

(Continued from page 401)

room during the summer months are materially below those during the winter months.

Brief mention might be made of use of gas in a third of the four plants, where dolomite is calcined in rotary kilns comparable to cement kilns, prior to its use in the carbothermic and ferrosilicon plants. The two kilns are 8′ in diameter and 308′ long. High pressure gas burners are used with a pressure at the burner of 42 pounds. Oil standby burners are available for use should it become necessary to curtail gas use. The burners, either gas or oil fired horizontally in the center at the kiln end, develop a temperature in the kilns at approximately 2400° F. The average hourly use of gas per kiln is slightly more than 50,000 cu.ft.

The Permanente Metals Magnesium plants have been in operation for some time and it may be of interest to indicate the amount of natural gas which was utilized during the first eight months of 1943. The total quantity metered at the three plants using gas amounted to 6,287,895,000 cu.ft. This is at an average rate of better than 26,000,000 cu.ft. per day. There are very few industrial operations today producing materials for the war program where such vast quantities of natural gas are used.

It is a tribute to gas that its availability in California makes possible this contribution toward an early winning of the war.

Industrial and Commercial Gas Advertising for October

The National Advertising Committee of the Industrial and Commercial Gas Section, J. P. Leinroth, chairman, and F. B. Jones, vice-chairman, announces that full page advertisements will appear in the trade and business magazines listed below during the month of October. These advertisements are prepared in cooperation with the Committee on National Advertising as a part of the industry's national advertising campaign.

MAGAZINE	THEME
	General Advertising
BUSINESS WEEK (Oct. 16—⅔ page)	"Scarce Alloy Steels? . . . *GAS heat-treating* helps save them for the war jobs they have to do!"
	Metals Industry
STEEL (Oct. 4) METAL PROGRESS METALS & ALLOYS	"Scarce Alloy Steels? . . . *GAS heat-treating* helps save them for the war jobs they have to do!"
STEEL (Oct. 25) THE IRON AGE (Oct. 21) INDUSTRIAL HEATING	"To conserve GAS for Greater War Production . . . make sure you use it efficiently."
	Ceramic Industry
CERAMIC INDUSTRY	"Versatile Clay . . . and GAS . . . a team for victory and post-war progress!"
	Baking Field
BAKERS WEEKLY (Oct. 25)	"Green Help? It's less of a problem with GAS equipment."
	Hotel and Restaurant Fields
RESTAURANT MANAGEMENT HOTEL MANAGEMENT	"It takes *food* to make planes! . . . and *GAS cooking and baking* play a major role in war industry plants . . . as with the armed forces."
	Hospital Field
MODERN HOSPITAL	"Green Help? It's less of a problem with GAS equipment."

DESOLDERING GAS METERS

(Continued from page 404)

number of meter parts with this process and this, of course, helps the economics of the operation. It pays also to separate the brass pipes and indexes from the sheet metal parts as a more favorable price can be obtained from the scrap dealer as a result.

The principal advantages of the desoldering process are that it provides a source of reclaimed solder that formerly was not available to us and it reduces the storage space required for condemned meters. There is an economic advantage also in our situation but there are so many variables involved that it is better for those interested to base such estimates on their own circumstances. Our post-war policy regarding continuation of the desoldering process is a point on which we are reserving judgment for the present.

Technical SECTION

HAROLD L. GAIDRY, *Chairman*
CHARLES F. TURNER, *Vice-Chairman*
A. GORDON KING, *Secretary*

Cathodic Protection Interference

By A. V. SMITH

Consulting Engineer,
1617 Pennsylvania Boulevard,
Philadelphia, Pa.

THE purpose of this paper is to bring under one heading the most important of the many factors governing the relation of cathodic protection on one structure to another unprotected structure. This paper, therefore, will deal with cathodic interference, and not necessarily with cathodic protection as related to the protection of a pipe line.

A simple explanation will be given of the effect of anodes, with diagrams explaining the effects wherever such diagrams are possible, and some actual data for tests made to show the effects of cathodic interference and how such problems should be handled. No explanation will be given in this paper as to how all the measurements for cathodic protection should be made, although in some cases parts of the methods of measurements will be described.

Anode Effects

Where a point anode is used in a homogeneous earth the equipotential lines, if no other structure were in this electrical field, would have the pattern surrounding this anode exactly the same as if a pebble were dropped into a pond of still water, that is to say, lines around the anode would be concentric circles. When the current is flowing into the anode to discharge into the earth, the potential of the anode is raised high above the surrounding earth, the potential grading off in all directions much the same as from the peak of a volcano. This potential difference would cause current to flow into the ground from the peak (anode) symmetrically in all directions much the same as the waves progress from the point where the pebble is dropped into the still pond.

If some other structure crossed through this field such as a pipe line represented by the straight line in Figure 1, it will be noted that such a pipe line would cross a multiplicity of equipotential lines which are concentric circles the amplitudes of which reduce in inverse proportion to the radius. This steep cross-gradient would cause a current to flow on the pipe line away from the anode in both directions toward the largest diameter equipotential circle as indicated by the arrows. We have considered in this Figure 1 that the cathode is at a remote point and does not affect the anode field. Just outside the rim of the largest circle the pipe passing through the circles will start to discharge current to return to the cathode.

Presented at A. G. A. Distribution Conference, Cincinnati, Ohio, April 29-30, 1943.

Again considering only the anode, if the pipe lines crossed the lines of equipotential at some point a considerable distance away from the anode as shown in Figure 2, there would only be a very slight gradient (as is indicated) traversed by the pipe line, and the flow of current on the pipe would therefore be very small.

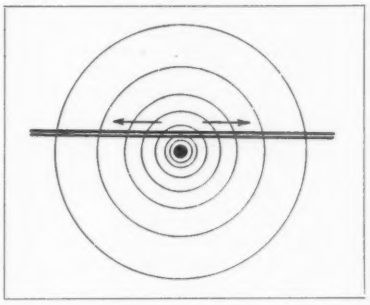

Figure 1

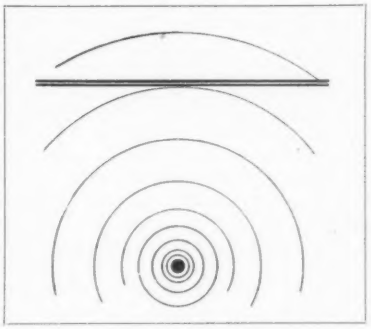

Figure 2

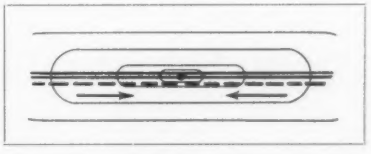

Figure 3

The field of a cathode, if it were a point cathode, would be exactly the same as an anode except that the cathode would make a volcano "dent" in the ground potential instead of an upright volcano, and its field shape would be the same concentric circles as a point anode. However, if the cathode were a pipe line extending toward what might be called electrical infinity in both directions, the equipotential lines around the cathode would not be concentric circles, but would be elongated ellipses as shown in Figure 3.

Excluding the effect of the anode now, and considering only the effects of the cathode, if a foreign pipe line were laid adjacent to and parallel to the pipe line acting as cathode as indicated by the dashed line, the foreign pipe line would cross a multiplicity of flow lines as shown in Figure 3. The current flow on the foreign pipe line, therefore, would be from the extremities toward the center where the cathode attachment was made as shown by the arrows in Figure 3.

Now to mix these conditions all up together at one location with a pipe line to be protected by cathodic protection acting as cathode, a foreign pipe line adjacent and parallel to the protected pipe line and the *anode set close to both* of these structures, the result would be the vector sum of all the equipotential lines at this location. If the tedious process of working out the configuration were completed it would be found that the anode gradient, if the anode were a point anode, would predominate, the current flow on the foreign structure would be away from the anode location, and the current flow on the protected pipe would be toward the cathode attachment.

Now if the pipe line lay-out remains the same, and the anode is moved out at right angles to the pipes to a point a great distance away and for description to a point just this side of electrical infinity the anode field would have little effect and the cathode equipotential lines would predominate. This would result in a flow of current on the foreign structure from the extremities toward the center and point adjacent to the anode, and the current on the protected structure would also flow toward the center but toward the cathode attachment from its extremities. This is a reverse of current flow on the foreign structure from the flow with the anode close to both structures.

It is obvious, therefore, that somewhere on the line at right angles to the parallel

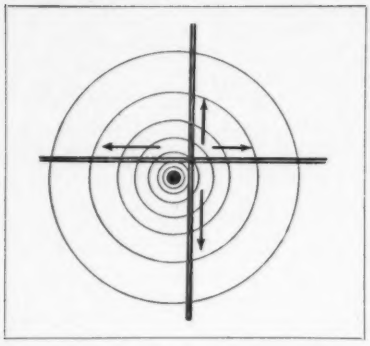

Figure 4

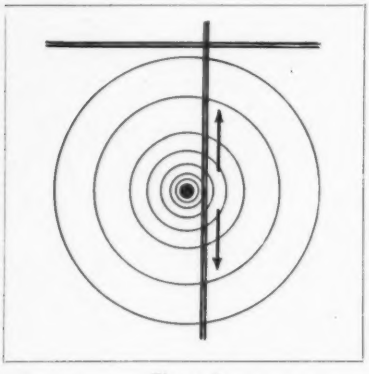

Figure 5

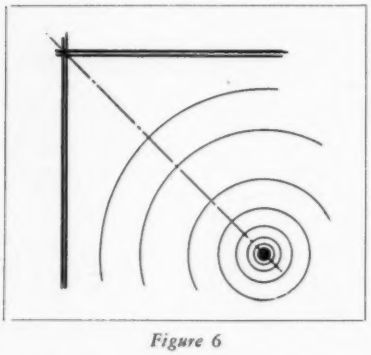

Figure 6

pipe lines between the adjacent position and at infinity there is a point where the anode would have a minimum effect on the foreign structure because the anode and cathode fields would be more nearly balanced at that point. Since the two fields of the point anode and the pipe line cathode are not symmetrical an exact balance point could never be reached. As will be pointed out later in this paper the point favoring the smallest flow on the foreign structure in the direction from its extremities toward the cathode attachment on the protected structure should be selected. If the foreign pipe line extended in two directions as shown in Figure 4 and the anode was at the intersection, the current flow on the foreign structure would then be equal in all directions as shown by the arrows.

Considering again only the anode effects, if the anode was moved from one of the lines and still remained adjacent to the other line as shown in Figure 5, current would flow on the one line as shown by the arrows. Obviously from this geometrical lay-out it would be seen that the minimum effect of the anode on this two direction of structures would be at a distant point on a 45 degree line as shown in Figure 6. If, however, this foreign structure became a network so that the pipes would be on both sides of the anode, and at unequal distances, the minimum effect would be at a point equidistant from all the structures. However, considering this for a moment (as in a city network of streets) where the distance between the horizontal lines as shown in Figure 7 might not be the same as the vertical distance between lines as shown in Figure 7, it will be quite obvious that the horizontal lines would carry current and it could not be arranged so that the vertical lines would be across the same equipotential lines as the horizontal pipe line. Since this is the best possible location for the anode it should be quite obvious that some part of the network will have to carry some current. From the standpoint of the foreign structure this is cathodic interference.

Figure 8 shows the potential profile of an anode placed some distance from the parallel pipe lines, the pipe line "X" being connected to the anode and the pipe line "Y" merely parallel to pipe line "X". The profile for the negative dent of "X" is made up of the effect of the anode plus the potential due to the effect of the cathode while pipe line "Y" merely has the effect of the cathode. For this reason it will be noted that a potential difference exists between pipe lines "X" and "Y" as indicated by "E".

If two pipe lines are laid in the ground parallel to each other and extending in each direction for all practical purposes to near electrical infinity, the pipe lines near electrical infinity, assuming no other effect than that of an anode close to the pipes, will be at equal potentials. The maximum potential difference between the two structures will be at a point directly opposite the anode, or the cathode attachment.

If a zero resistance bond was installed between the two pipe lines at the point directly opposite the anode the two pipe lines would then be at the same potential throughout. Since it is not practical to install a zero resistance bond there will be some unbalance in potential between the two pipe lines. This unbalanced potential, when the anode is at some distance from the pipe lines, may be used to cause a delivery of current from the foreign structure to the protected structure by placing the anode beyond the balancing point. However, it should be stated here that if the radial current produced by a point anode is large the bond will not eliminate the radial current effect at points remote from the bond.

In considering two parallel pipe lines and their current flow in structures with the anode close to the structures, the currents would be represented by the curves in Figure 9. In Figure 10 are shown the same conditions with the anode moved out a great distance. It will be noted that the current flow line for the foreign structures has been completely turned over. At some point between the point of Figure 10 and the pipe line the anode could be placed so that the curve for the current flow on the foreign pipe line would be reduced to zero as shown by the dotted line. This will occur when the foreign pipe line becomes a conjugate part of the cathodic protection circuit. However, it is not practical in most cases to obtain a point where less than 5% of the anode current is in the foreign pipe line.

Eliminating Effect of Anode

There are two methods that can be used to eliminate the effect of the anode when it has been placed at a point to give the minimum effect. One would be the installation of an electrical bond between the two structures so as to remove all the picked up current from the pipe line, and the other method would be to install a sufficient number of insulating joints at proper locations in the foreign structure to eliminate the flow of current on the pipe line.

Referring to Figure 1 it can be seen that the use of insulating joints in such a steep gradient may be hazardous and, therefore, better engineering results would be obtained by using insulating joints only in conjunction with the movement of the anode away from the pipe lines to the balance point.

When the anode has been placed so that the foreign structure becomes a conjugate

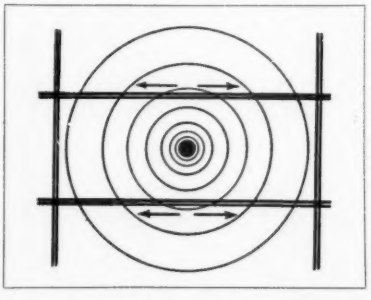

Figure 7

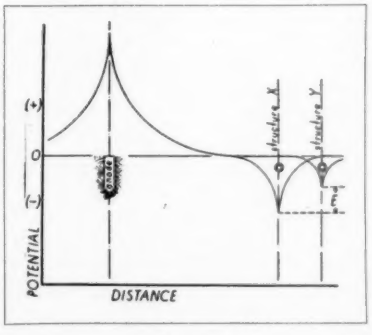

Figure 8

part of the cathodic protection ground network it will be found, as previously stated, that the foreign structure will carry a small amount of current. This current is, therefore, termed the "residual current" because it is the interference current remaining in the structure after the anode has been placed at the best possible balance point.

Interference Determined

It probably will not be practical in all cases to place the anode at a point where the residual current or interference current is less than 5% of the anode current. The anode should therefore be placed on the far side of the balance point so that the minimum interference current on the pipe line will flow from the extremities of the foreign structure toward the protected pipe line cathodic attachment. Under these conditions the interference current may be removed by an electrical bond between the two structures.

The interference current which must be removed from the foreign structure may be determined in the following manner:

Referring to Figure 9, terminals are selected at various intervals along the foreign structure for the measurement of the ground voltage and the measurement of the current flow in the pipe line. Referring to the curve for the theoretical flow on the pipe line as shown in Figure 9 the current at terminals CD and IJ would be a maximum and the current at terminals EF and GH are a minimum. In other words, the difference between terminals CD and terminals EF represent the gain or loss of current between the points CD and EF and likewise the difference in currents at terminals IJ and GH represents the gain or loss from the opposite side of the anode position. Therefore, the sum of the currents at terminals CD and IJ would be the total interference current if these terminals had been properly selected so as to show the maximum current.

If the terminals CD and IJ are selected so that when increments of anode current are used there is no ground voltage change observed at the Vg terminals the point where there is no interchange of current between the pipe and earth has been reached and is often referred to as the point of zero potential. At this point of zero potential the maximum interference current will be found in the pipe line.

Determining Resistance of Bond

Again referring to Figure 9 and the above description an electrical bond installed between the cathodically protected pipe and the foreign structures must produce a flow of current equal to, or greater than, the loss of interference current as measured between terminals CD and EF (the terminals at the zero potential point). Major terminals are therefore selected (Figure 11) as between the two structures and increments of current are produced in these terminals with a test battery. The effect of the increments of current at the terminals along the foreign structure are measured and these data tell how much current will have to be delivered between the two structures to eliminate the loss of interference current. Likewise, the effects of these increments of current are also determined for the cathodically protected line.

If the internal resistance between the two structures is known then sufficient data are at hand to design the electrical bond which will remove the interference current. For simplicity in the description of the design of this bond, let us assume that there are no extraneous potentials between the two pipe lines.

Referring to Figure 11, the internal resistance between the two pipe lines should be measured by using current from a test battery in terminals I_2 and reading the corresponding voltage drop at terminals E_2. (Note that there are two independently connected circuits to avoid errors which will be produced by IR drops in commonly connected leads.) The internal resistance is then:—

$$\frac{\triangle E_2}{\triangle I_2} = R_{2,2}$$

With the voltmeter still connected as E_2 the anode current is then operated and I_1 recorded. These data produce:—

$$\frac{\triangle E_2}{\triangle I_1} = R_{2,1} = \text{Coupling resistance}$$

Once the amount of anode current has been decided on, then $R_{2,1}$ times that value gives the voltage difference it will produce between the two lines $= E_2$. With this voltage a bond between the two structures must therefore deliver at least the current sum of terminals CD and IJ of Figure 9. The value of the resistance of this bond is determined from the following equation for the current flow:

$$I_2 = \frac{-E_2 + E_0}{R_{2,2} + B_2}$$

Solving for B_2

$$B_2 = \left(\frac{-E_2 + E_0}{I_2}\right) - R_{2,2}$$

There I_2 is the bond current

E_2 is the open circuit potential produced by the rectifier $= I_1 R_{2,1}$

E_0 is the galvanic potential between the structures.

$R_{2,2}$ is the internal resistance between structures.

The installation of a bond wire between the two structures having a resistance (total—including contact resistances) equal to or less than B_2 will eliminate the effect of the cathodic interference current on the foreign structure. From the above equation it will be seen that if the galvanic potential between structures (EG) is zero, the I_2 is approximately equal to the sum of the currents measured at terminals CD and IJ of Figure 9.

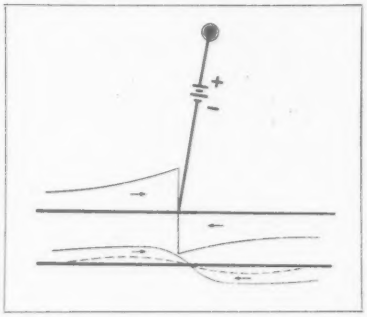

Figure 10

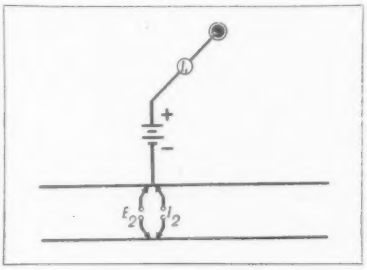

Figure 11

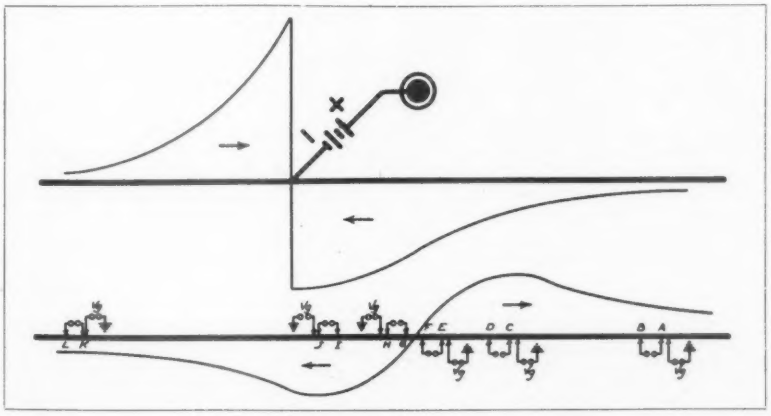

Figure 9

If there were extraneous potentials existing between the two pipe lines, or a pipe line and a lead sheath cable, the installation of the bond would cause galvanic currents to be superposed on the interference current. This superposed galvanic current would effect both the protected structure and the foreign structure, the effect depending on the polarity of the galvanic potentials. Also the installation of the bond would change the rectifier requirements for the protected structure. All of these factors may be accounted for by the proper application of the network constants. As a matter of record the formula which will take into account all the factors is recorded here for reference as follows:—

$$R_B = \frac{(E_B + I_1 R_{B,1})}{I_1 \times \frac{R_{2,1}}{R_{2,3}}} - R_{B,B}$$

Where:

$R_{B,B}$ = Internal resistance between structures.

$R_{B,1}$ = Coupling resistance between structures from anode current.

$R_{2,1}$ = Vg coupling for worst exposure on foreign structure.

$R_{2,B}$ = Coupling from bond current at same Vg.

$R_{3,B}$ = Vg coupling for worst exposure on protected structure.

$R_{3,1}$ = Coupling for anode coupling at same Vg.

I_1 = Total anode current, including increase due to Bond Current I_B.

$$I_1 = I_0 \times \frac{R_{2,B} \times R_{3,1}}{(R_{3,1} \times R_{2,B}) - (R_{2,1} \times R_{3,B})}$$

$$I_B = \text{Bond Current} = -I_0 \times \frac{R_{2,1} \times R_{3,1}}{(R_{3,1} \times R_{2,B}) - (R_{2,1} \times R_{2,B})}$$

I_0 = Anode current needed for protection, foreign structure NOT bonded.

Examples of Actual Interference Cases

To make the explanation of cathodic interference given in this paper have some practical value I will describe some actual cases of cathodic interference which show their relation to the theoretical curves of my report and demonstrate various considerations of the cathodic interference problem.

CASE 1. The first case will be where two structures cross at oblique angles as shown in Figure 12. Cathodic protection was applied by the owners of structure "X" to protect their underground cable system from corrosion. Their preliminary studies were made along their own structure entirely ignorant of the fact that another structure was in this area. Their anode was placed at a point shown as location "A" in Figure 12, and was actually placed 276 feet from the structure "Y".

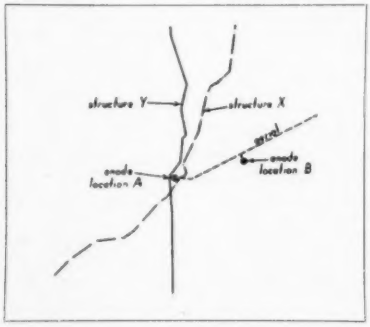

Figure 12

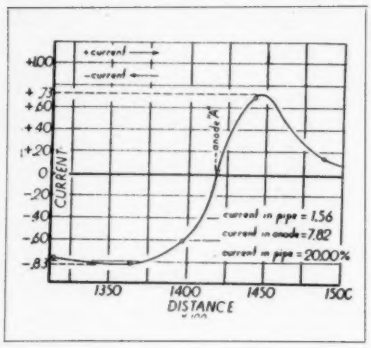

Figure 13

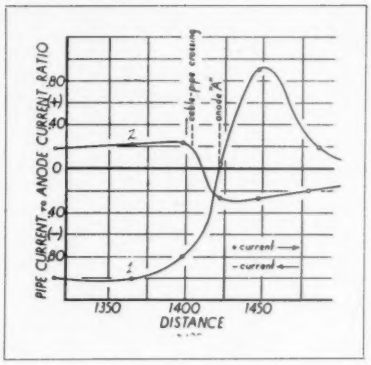

Figure 14

The interference was discovered by the engineers for structure "Y" when making a periodic survey of the pipe in this territory.

Figure 13 shows the curve plotted from the data for the interference current flow on the pipe line "Y" from the anode location "A" in Figure 12. Referring to this figure it will be noted that, with the rectifier furnishing 7.82 amperes into the anode, the pickup of current from this anode by the foreign structure "Y" would be 1.56 amperes, or 20% of the anode current. Referring to the curve in Figure 13 it will be noted that the pick up of the current extends from the anode location for about two and a half miles, and that beyond this point the discharge occurs. This shows how impossible it would be to do much about the discharge at distances in this order if interconnections were to be made at the points where the discharge current would return to the cathodically protected structures. Several miles of wire would be needed either side of the crossing and an enormous amount of copper conductivity would be needed to make up for the resistance of such long conductors.

It was therefore decided to endeavor to pick a point where the anode would not interfere with the structure "Y" and structure "Y" would be the conjugate part of the cathodic protection ground network. Referring to Figure 12, the dotted line represents an aerial cable extending at an angle from the two structures. By a consideration of the geometrical lay-out of the structures, the knowledge of the behavior of the soils in this territory, a test anode was placed at location "B" and the aerial cable was used as a connecting wire to this anode. It was found that the location "B" was just a trifle beyond the conjugate point. Moving the anode back toward the cable run to the conjugate point would have placed the anode at the top of a hill in high resistance soil. It, therefore, seemed more practical to leave the anode in the creek at the bottom of the hill, and since the anode was beyond the point where the structure "Y" became a conjugate part of the cathodic protection ground network the residual current could be delivered through a single resistance bond at the point of crossing, for the unbalance would be in the proper direction to secure cathodic protection from such delivery.

With the anode at this location the interference current found on the structure "Y" is represented by Curve 2 of Figure 14, and Curve 1 of this figure shows the relation of the original curve with the anode at location "A". It will be noted that, under the condition of Curve 2, a bond installed between the two structures at their point of crossing would now deliver current in the proper direction at that point, while under the condition of the anode at "A" two enormously conducting bonds would have to be installed between the two structures at points remote from their crossings where the separation of the structures is in miles and the bonds are less effective.

Referring to Figure 14 it is interesting to note that Curve 2 does not cross the zero point at the point where the cable crosses the pipe line. This was found to be due to the fact that there is quite a parallel of the structures before they cross, and that the parallel is in relatively low resistance soil with higher resistance soil beyond the crossing.

In this case I would like to point out that the engineers of structure "X" installed cathodic protection on their structure without consideration of the effects on another structure, in fact they had no knowledge that another structure was in this territory. The engineers, in selecting the anode location for location "A", undoubtedly found that at this point they obtained a very good spread of the cathodic protection currents. This alone should have been an index finger which pointed out to them that the spread might have been due to the proximity of a foreign structure, but it apparently did not. The proper location for the anode was selected you might say almost by guess. By

this I mean that it took no particular effort or difficult consideration of a great quantity of factors to pick a point where the interference problem could be solved quite readily. The geometrical lay-out of the structures more or less predetermined the requirements.

CASE 2. In Case 2 it will be shown how a cathodic interference case was handled by the engineers of a structure who realized their responsibility in cathodic interference and engineered the problem completely as it should always be done.

Figure 15 shows the schematic lay-out of two pipe lines. The engineers for structure "X" desired to install cathodic protection on their line and were aware of the presence of structure "Y". They therefore selected terminals on structure "Y" as shown in Figure 15 and the interference currents were measured with the test anode at location "A". This anode consisted of four 20 foot lengths of 6" scrap pipe laid in the creek 1271 feet away from structure "X". This anode was found to have an internal resistance of 3.7 ohm and with the anode at this location the following network constants were measured:

At terminals CD the ground voltage coupling was zero, and the current flow coupling was:

$$\frac{I_{CD}}{I_A} = 0.0246$$

This shows that the CD location was the point of maximum current flow because the ground voltage coupling was zero. At this point there was therefore 2.5% of the anode current in the pipe line. The anode was then moved to the second test location and consisted of four 20 foot lengths of 6" scrap pipe laid in the creek bed. At this second location the internal resistance was found to be 5.89 ohm. For this anode location the network constants measured at the three points are given:—

Increments at A'	*Increments at (2)*
AB = 0.0069	—0.216
CD = 0.0148	—0.339
EF = 0.0101	—0.476
Vg_{AB} = 0.002 ohm	—0.0016 ohm
Vg_{CD} = 0.0000 ohm	—0.0006 ohm
Vg_{EF} = 0.0011 ohm	—0.0049 ohm

$R_{2,A'} = 0.0498$ ohm

$R_{2,2} = 0.112$ ohm

Under the condition with the anode at the second location (A') the anode current in the foreign structure is 1.48% ($I_{CD} = 0.0148\ I_A'$).

Referring to Figure 15 it will be seen that the difference in the current couplings between AB and CD is the net gain or loss in the section of line between the two points. The couplings showed a loss of interference current between CD and EF as follows:—

$$I_{CD} = 0.0148\ I_A'$$
$$I_{EF} = 0.0101\ I_A'$$
$$\text{Loss} = I_{CD} - I_{EF} = 0.0047\ I_A'$$

The gain in current in this section by the installation of a bond between the structures is indicated from the network constants as follows:—

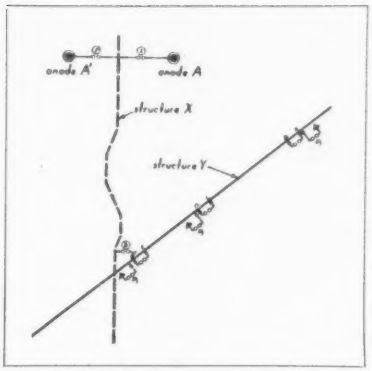

Figure 15

$$I_{EF} = -0.476\ I_2$$
$$I_{CD} = -0.339\ I_2$$
$$\text{Gain} = I_{EF} - I_{CD} = -0.137\ I_2$$

Since the condition to be satisfied for the elimination of interference is that interference current loss must equal the bond current gain then:

$$0.0047\ I_A' = -0.137\ I_2$$

Therefore the current which the bond must deliver is:

$$I_2 = \frac{0.0047\ I_A'}{-0.137} = -0.858 \text{ amperes}$$

Since location EF is immediately adjacent to terminals (2) the total current I_2 must be the current at EF plus the current immediately beyond EF. The current beyond EF is, by Kirchhoff's law for currents at a point:—

$$1.000\ I_2 - 0.476\ I_2 = 0.0524\ I_2$$

The anode current in the pipe beyond EF plus the bond current in the pipe beyond EF is equal to zero:

$$0.0101\ I_A' + 0.524\ I_2 = 0$$

$$I_2 = \frac{0.0101\ I_A'}{-0.524} = -0.479 \text{ ampere}$$

This indicates that a bond having a current of 0.858 ampere will eliminate the cathodic interference on the structure "X". This resistance is determined from the following formula:—

$$I_2 = \frac{E_2 + I_A' R_{2,A'}}{R_{2,2} + B_2 + B_2}$$

Where:

- I_2 = Current in the bond between two pipe lines.
- E_2 = Galvanic potential between two pipe lines.
- I_A' = The anode current of cathodic protection equipment.
- $R_{2,A'}$ = Mutual coupling resistance.
- $R_{2,2}$ = Internal resistance between two pipe lines.
- B_2 = Desired bond resistance.

$$-0.858 = \frac{-0.167 + (25.0 \times 0.0498)}{0.112 + B_2}$$

Solving for B_2:

$$B_2 = 1.54 \text{ ohm}$$

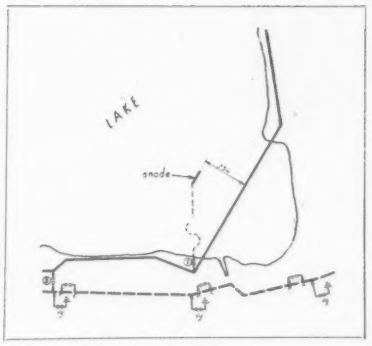

Figure 16

It was not believed advisable to design the bond so close that it merely removed the interference current. On this basis the bond current value of —0.858 ampere was increased to —1.000 ampere and under this condition the bond resistance was found to be:—

$$B_2 = 1.30 \text{ ohm}$$

From the Vg couplings the ground voltage conditions can be worked out readily.

When the cathodic interference survey was completed tests were made by the engineers of structure "X" on the foreign structure "Y" to make sure that no high resistance joints existed in the foreign pipe line which would be hazarded under the interference current. In this particular section no high resistance joints were discovered but the point is that the survey was made by the engineers of structure "X" to determine that fact.

In this Case 2 I would like to point out that the engineers for structure "X" did all the survey work, installed the interconnections, etc. and that the engineers for structure "Y" merely had to act as interested spectators as far as test requirements were concerned.

CASE 3. This case is an example where the engineers for structure "X" desired to install cathodic protection on the section of pipe laid in the bed of a lake. This installation was to provide cathodic protection under microbiological anaerobic corrosion conditions.

Figure 16 shows the general lay-out of the structures involved in this problem and the anode location was so designed that it would produce a minimum effect on the foreign structure "Y". By test it was found that this condition would be obtained if the anode was placed 754 feet on a line at right angles from the center of the pipe in the lake.

A rather unique method of constructing and installing the anode was used in this instance. The 200 feet of pipe was welded together in sections and as each section was welded a copper cable was strung inside the pipe and brazed to the center of a plate welded across the end of the section of pipe. This meant that the copper cable was suspended inside the pipe, held from contact with the sides of the pipe by being drawn

taut and held taut in place by the brazing to the plate at the end of each section. When the 200 feet of main had been welded together oil drums were then welded to the pipe by iron bands. The drums were plugged impounding air and the entire anode structure was then floated by the buoyancy of the oil drums to the location desired. The drum at the center of the anode structure was then punctured allowing the center of the structure to sink slightly. The next two adjacent drums were then punctured and this procedure was continued until the anode sank center first to the bottom of the lake. With the anode in place it was found that the foreign structure "Y" carried an interference current from the anode of only .16 per cent (sixteen one hundredths).

The foreign structure was a coated pipe and had been laid in the cinder filled roadbed of an abandoned railroad. If a cinder from this railroad was against the pipe at any point it would produce a corrosion failure. Since such a failure is very probable it might have been interpreted that the interference current of sixteen one-hundredths of one per cent might have contributed to the failure. The engineers for structure "X" therefore planned to remove the interference current by a residual bond between the two structures at the point of terminals 2 in Figure 16.

By solution of the network constants it was found that a resistance bond adjusted to 1.52 ohm would leave the foreign structure electrically unaffected by the installation of the cathodic protection equipment of structure "X". However, the ground voltage coupling at a point near terminals CD (Figure 16) indicated that the ground was suppressed by some undetermined influence. While this influence was not related to the rectifier current the engineers for structure "X" felt it advisable to correct this ground voltage by increasing the bond current I_2. To eliminate the bad ground voltage condition a bond having a resistance of .642 ohm was installed and delivered 0.7 ampere from the "Y" structure.

The doubling of the required current was not intended to protect the foreign structure from corrosion from cinders resting against the pipe because there is nothing that can be done in this situation to prevent corrosion of the foreign structure by a cinder by the use of cathodic protection. Removing the cinder or cinders is the only remedy.

The important point in Case 3 is that the engineers for structure "X" had reduced the interference current to but .16 per cent and even under this condition the engineers for structure "X" felt it desirable to remove even this small percentage of cathodic interference.

CASE 4. To show the complications of cathodic interference in city networks I have selected a case which demonstrates several conditions described in the first part of this paper. Figure 17 shows the general lay-out of a cable system (which needed cathodic protection), a network of gas mains and an oil line. The engineers for the cable

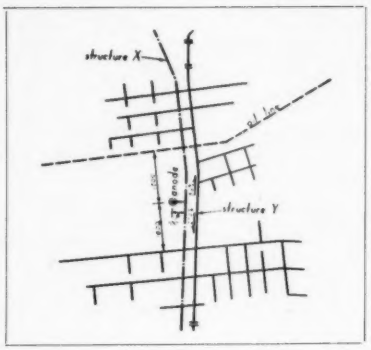

Figure 17

system installed a rectifier as shown in Figure 17 with the anode 100 feet from the cable system in a vacant lot. Under this condition the interference currents observed in the gas main system is shown by the arrows with figures which show the percentage of interference current and its direction of flow. It will be noted that the interference current amounted to 46% of the anode current. The engineers for the cable company then suggested, upon our complaint, that the anode be moved further away from the cable system in an attempt to make the gas main system become a conjugate part of the cathodic protection circuit. As the anode was moved away from the cable system the oil line, as represented by the dotted line, and the gas main system on the opposite side of the anode running at right angles to the cable system then began to carry appreciable interference current. If the anode was moved far enough to make the gas mains which parallel the cable system a conjugate part of the cathodic protection network the gas mains and structures running at right angles to the parallel then carried an appreciable amount of interference current. Also with the anode placed a considerable distance away, the foreign network starts to shield the cable system making protection for the cable more difficult.

CASE 5. One of the most flagrant cases of cathodic interference was in a city network where a 250. ampere rectifier was installed in an electrolysis drainage connection between an underground cable system and the negative bus of a D.C. railway substation. This rectifier actually produced reversals of current flow in a piping system electrolysis drainage connection when the railway load was at a minimum. Of course, effectively this rectifier was always acting against the other mitigation systems. It was installed because the engineers for the cable system found that they could not obtain clearance with straight drainage with wires equivalent to 1,650,000 cm operating between their cable plant several hundred feet from the negative bus and the negative bus.

Measurements of the network constants and the correlation of potentials indicated that the difficulties were apparently due to contacts existing between the cable system and the water and gas piping systems. After a sufficient number of these contacts had been found and removed the cable system was able to obtain clearance without the use of the interfering rectifier.

In connection with this case it was interesting to note that some of the cable leads along which the contacts existed did not show any appreciable normal drop on the cable sheaths while the system was in operation. However, when the cathodic protection circuits were opened there was an enormous drop on these cables. This demonstrates how absolutely necessary it is to understand the superposition of currents. The only way to find the rectifier current in a network where other currents exist is by producing increments of the rectifier current and observing the effect of these increments at all points in the network.

In this case the cable company installed the rectifier and its hazardous effects were only eliminated by full cooperation between the utilities in determining the existing conditions and eliminating interconnections.

Remedies for Cathodic Interference

In the first part of this paper the regulation of interference currents by moving the anode to the best possible balance point was described. Cases 1 to 3 demonstrate how this was done in practice.

The use of insulating joints in the foreign structure will be found helpful only where the anode has been moved to the best possible balance point otherwise it is hazardous.

Case 4 demonstrates the enormous amount of interference current which will be found on foreign structures in the city networks almost regardless of the location of the anode if it is remote from the structure. By a remote anode is meant one which is more than several pipe diameters away from the structure to be protected.

The only place where an anode can be used in a city network with unappreciable interference currents is where the anode is a parallel anode laid so close to the structure to be protected that its field will not spread to the other structures in the street. Due to this required proximity little protection will be obtained beyond the linear length of the parallel anode. In other words, the parallel anode must be installed throughout the extent of the area to be protected.

Cooperation

Where two structures are located within a reasonable distance of each other and cathodic protection is installed on one structure, cathodic interference will undoubtedly exist to some extent on the other structure. If properly handled this interference current will in no way endanger the foreign structure. Also this interference can be used to provide some protection for the other structure. The only way to obtain these desirable results is through the full cooperation of both or all the involved structures.

In the mid-continent the corrosion engineers have formed together for cooperation in such problems under an association called the "Petroleum Industries Electrical Association." These engineers are well established in handling the cathodic protection interference problem as it should be conducted, and it should be an example to all other engineers using cathodic protection.

Of course, it is absolutely necessary that the cooperating engineers properly design both the cathodic protection installation and the installation to eliminate cathodic interference.

Summary and Conclusions

Cathodic protection cannot be installed on any one structure in a city network if a remote anode is to be used, for such an installation will produce cathodic interference. Outside of the city networks where the separation between the pipe lines is such that a remote anode may be used with a minimum effect on the foreign structure, cathodic interference may be eliminated by a properly designed residual bond.

There is a proper and exact engineering solution to the cathodic protection interference problem, but this cannot be obtained unless the engineers for the various structures cooperate fully, and thoroughly understand the full implications of cathodic interference including superposition of currents.

Acknowledgments

I wish to express my appreciation to Dr. J. M. Pearson and Raymond F. Hadley of the Susquehanna Pipe Line Company for their valuable help in my studies of cathodic interference and the suggestions they have made during the preparation of this paper.

Post-War Technical Group Named

J. V. Postles

A TECHNICAL Section committee to cooperate with the Post-War Planning Committee was appointed last month and held its first meeting at A. G. A. headquarters on September 15. J. V. Postles, The Philadelphia Gas Works Co., is chairman of this group which will carry out technical studies in cooperation with the main committee under Chairman A. M. Beebee. Mr. Postles is a past chairman of the Technical Section.

Other members assisting Mr. Postles are H. B. Andersen, The Philadelphia Gas Works Co.; L. E. Knowlton, Providence Gas Co., and T. L. Robey, Washington Gas Light Company. These men represent the distribution, production and chemical phases of the industry, respectively.

A Tribute to the Late Dr. Mighill

By F. X. ASSELIN, *General Supt., Porto Rico Gas Co., San Juan, Porto Rico*

SOMEWHERE in the great beyond, where the souls of all men journey to receive their place in eternity, it was probably crowded on the day of September 14, 1943. Many God-fearing, peace-loving American boys were taking leave of their buddies on Salerno beach to travel to this busy place, where friend and foe alike stood side by side. In that great milling crowd on this 14th day of September, a little old man must have inconspicuously taken his place. His clothes were civilian, for, although he had seen many wars in his more than 3 score years, he wore no uniform, for his had always been the battle of science. Standing there quietly and unassuming and forever removed from the American Gas Industry he had served so long and so well was the lovable Dr. T. A. Mighill.

In leaving us for a well-deserved rest, he takes with him one of the brilliant minds of our age, a mind developed more and more during his every waking hour. Question, if you will, my placing him in the same class with such great contemporaries as Einstein, but by what norm can we evaluate greatness of mind? To all who knew him, Dr. Mighill was symbolic of knowledge and science. His helping hand was given to all without reserve and covered problems from the most intricate to the most simple. To each he gave his all, and when he came forward with an answer, its accuracy could stand any test.

The Gas Industry has been the recipient of many worthwhile contributions from the hands of Dr. Maghill. His wisdom has helped plants all over the United States, yes, even as far as the little isle of Puerto Rico. By remote control, his uncanny deductive powers have chased gremlins and solved problems near and afar.

Usually it is easy to separate the two egos of man and worker, but in Dr. Mighill's case this is difficult. At home he was piper, mechanic, carpenter, and on clear nights he studied the celestial bodies in a small astronomy laboratory of his own construction. He spent three or more hours daily traveling to and from his work and each such trip brought forth a sheet of paper covered with the workings of trigonometry, calculus or other problem. He loved to work out and derive the most intricate of formula using no handbook save the magnificent store of knowledge of his ever-active mind.

So, maybe you who fought at Salerno didn't notice or know the little old man who stood by your side that day in the halls of judgement. Maybe you wondered what he was doing amidst so many of the youthful heroes of all nations. Should you have known him? Maybe not,—but perhaps,—mind you, only perhaps, that same little old man may have had a small part in helping your mom to warm the water for your first bath.

Science and the American Gas Industry have lost much, how much we shall never know. We who knew him well will never forget him.

Stronger Tin Alloys

A FURTHER contribution to the development of stronger tin-base alloys suitable for use as bearing metals is reported in a paper by Dr. W. T. Pell-Walpole, in the *Journal of the Institute of Metals* for June, 1943.

The tensile properties of a series of tin-antimony-cadmium alloys were examined after quenching and prolonged tempering treatments. It has already been shown (*Journal of the Institute of Metals*, Oct. 1942) that the hardness of tin-base alloys in the range antimony 9 to 10 per cent, cadmium 1 to 1½ per cent, balance tin, can be appreciably improved by heat treatment. It is now shown that the same range of alloys has improved tensile strength after quenching from the highest practicable annealing temperature followed by prolonged tempering at 140° C. The best alloy from this point of view contains 9 per cent antimony, 1½ per cent cadmium, balance tin. The tensile strength of the alloy reaches 6 tons per square inch as quenched and tempered, and this strength is retained at 140° C. This temperature was chosen as being near the maximum at which tin-base bearings may have to operate continuously.

Reprints of Dr. Pell-Walpole's paper (Publication 114.A) may be obtained on request to the Tin Research Institute, Fraser Road, Greenford, Middlesex, England.

Dwindling Traffic

FOR every 100 motor vehicles on the roads of the East in June, 1941, there were only 40 in June, 1943; for the Middle West and West, in the same months, the drop was from 100 to 57. Authority: the Public Roads Administration of FWA, on the basis of 559 traffic counters located on the rural roads of 43 states. Motor-fuel tax collections in 25 states in June were down 36% as compared with June, 1941; totalled approximately $28,182,000 during the month.

RAPID DETERMINATION OF CO

(Continued from page 408)

high, 12 inches wide, and 6 inches deep. In its operation a sample of gas was passed from the first container through the apparatus to the second container and the sample recirculated several times. This apparatus served our general purpose but possessed several disadvantages: The time required for a determination was one hour or more, discrepancies in the results were encountered on occasions, and the apparatus would only detect carbon monoxide in amounts down to 30 parts per million.

In 1934 the apparatus was completely re-designed incorporating the benefits of our previous experience and the work carried out by Vandaveer.[21] The apparatus has been improved from time to time so that the photos, Figures II, III, and IV, show the apparatus as at present. It is a sturdy, compact, and portable outfit as shown in Figure V.

(In Part II which will appear in a later issue, a detailed description of the portable iodine pentoxide apparatus including the purifying system, iodine pentoxide preparation and activation, potassium iodide absorber, circulating system, and other details will be presented. In addition the detailed procedure for the analysis of gas samples for traces of carbon monoxide will be described. Experimental results are included, showing the efficiency of the purifying train, and the accuracy of the apparatus as a whole on gas-air mixtures of known carbon monoxide content. The effect of other gases, preparation of reagents, and a sample calculation will be considered.)

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Men Needed to Man Merchant Marine

THE Merchant Marine is doing one of the really great jobs of this war. The first seven months of 1943 found American shipyards delivering 88 tankers, or a total of 908,200 deadweight tons. Many of these new ships are the T2's whose capacity is about 105,000 barrels of oil. Next year's construction schedule calls for 424 more ships, plus 102 converted Liberties. For these ships men will have to be found.

"The Recruitment and Manning Organization knows," says Marshall E. Dimock, Assistant Deputy Administrator in charge of Recruitment and Manning, "that if it continues to make clear to all Americans, everywhere the need for experienced Engineers, Mates, A.B.'s, Oilers, and Cook-Bakers in the Merchant Marine that these men will continue to come back as they have in the past. Wherever they are, if they will write the Recruitment and Manning Organization, Washington, D. C., or get in touch with their United States Employment Service office, they will be helping the Merchant Marine to victory."

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Industrial Gas Sales Engineer, M. E. Also experienced in all branches of the utilization and sale of gas. Experienced Power Engineer in the application of electricity and in the competition of private power plants. Desire position with utility manufacturer or consultant. **1467.**

Petroleum Engineer, geologist, economist, 25 years' experience, available fee, salary or contract basis. Preferred locations: California, West generally, Latin America. **1468.**

Production superintendent, general superintendent, or preferably as manager of medium size gas property, either coal or water gas. Experience covers sixteen years' operating and eight years' management with successful record. Middle age. Prefer location in South. **1469.**

Industrial Relations Director. Mechanical Engineer with well rounded experience in production, heating engineering, sales, sales management, employment, personnel, and industrial relations management. Suitable for manufacturer or large operating properties. **1470.**

Gas Engineer, technical graduate, beyond draft age, with thirty years' experience in all phases of water gas production and high and low pressure distribution, desires connection with gas company. All experience with one holding company or subsidiaries. Present position being abolished and activities being curtailed in the system. **1471.**

Chemist—graduate, draft exempt; broad gas company laboratory experience in raw material, plant operation and byproduct control. Could be very useful to manufacturer on purchased supplies. **1472.**

Promotional man with ten years' gas industry training. Five years large Metropolitan gas company; five with domestic appliance manufacturer promotional selling and dealer developing. Have planned advertising activities—extensive writing experience. Now in war plant on management detail work. Can relieve busy executive or handle alone varied responsibilities. Draft 3-A. **1473.**

POSITIONS OPEN

Accountant or **Engineer-Accountant** with initiative and resourcefulness—must be experienced in and have thorough knowledge and creative record in the field of Public Utility construction, plant and operations accounting. Headquarters and some work in New York with extensive travel required. Furnish full particulars of qualifications and experience. **0383.**

Gas Superintendent wanted by Eastern gas company to take charge of gas production and the plant. Good practical man required who thoroughly understands water gas production and is a good gas maker. Technical education an asset but not necessarily essential. Should be able to successfully handle himself, his men and gas production in present raw materials and plant personnel situation. Salary about $3500 according to qualifications. **0384.**

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